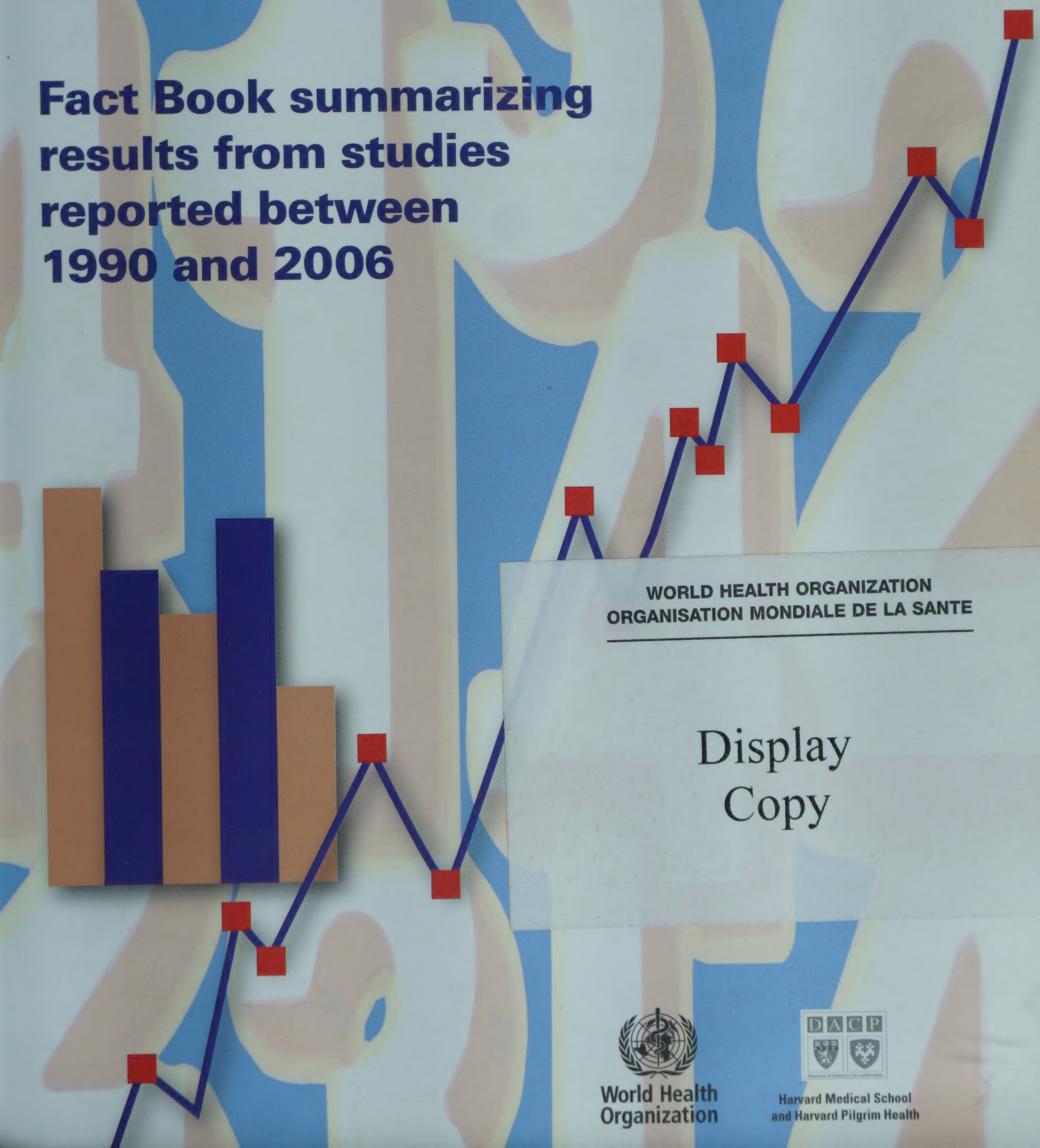
Medicines use in primary care in developing and transitional countries

Fact Book summarizing results from studies reported between 1990 and 2006



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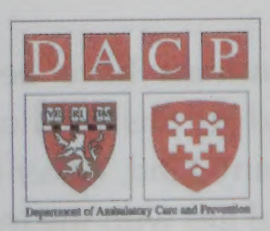

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PREFACE

Medicines are one of our most cost-effective health interventions. Billions of people take them every year. However, they are only effective if used correctly and there is evidence suggesting that more than half of all medicines are not used in an appropriate way. Such inappropriate use endangers lives and wastes money. Unfortunately, medicines use is not routinely monitored in many countries resulting in a dearth of information. Improving medicines use has not been a high priority globally or nationally, and many countries are not implementing core strategies to ensure appropriate use of medicines.

The first step to improving the current situation is to measure how medicines are used and this forms the basis of advocacy for change. This Fact Book describes the findings from a WHO database of all the medicines use surveys and interventions to improve use in developing and transitional countries at the primary care level, reported or published from 1990 to 2006. The aim is to provide a picture of medicines use in developing and transitional countries, and the impact of interventions, during the last 20 years.

We hope that the information presented here will stimulate action to increase the rational use of medicines and that it will inform and facilitate the setting of priorities and targets. We also hope that this Fact Book will be a useful tool for researchers, policy-makers, planners and others requiring such data. International agencies and donors may use the information in this Fact Book as baseline data to infer the impact of future activities. Professional groups and nongovernmental organizations can use the results for advocacy.

WHO created the database that is the basis for all the information contained in this Fact Book in order to fulfil its leadership role and obligations to monitor medicines use, as agreed in three World Health Assembly resolutions.[a,b,c]

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a *The rational use of drugs*; Resolution WHA39.27, 1986, Geneva, WHO.

b *WHO Medicines Strategy*; Resolution WHA54.11, 2001, Geneva, WHO.

c *Progress in the rational use of medicines*; Resolution WHA60.16, 2007 Geneva, WHO.

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We acknowledge the following contributors:

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All individual authors whose work is included in the database, and staff in the Documentation Centre of the Department of Essential Medicines and Pharmaceutical Policies, WHO and in the Rational Pharmaceutical Management Project in Management Sciences for Health, who provided reports and details of medicines use surveys.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

AFRO*	WHO Regional Office for Africa
AMRO*	WHO Regional Office for the Americas
ARI	Acute respiratory infection
EML	Essential Medicines List
EMP	Essential Medicines Policy
EMRO*	WHO Regional Office for the Eastern Mediterranean
EURO*	WHO Regional Office for Europe
ICIUM	International Conference on Improving Use of Medicines
IMCI	Integrated Management of Childhood Illness
INRUD	International Network for the Rational Use of Drugs
JRIUM	Joint Research Initiative on Improving the Use of Medicines
MD	Medical Doctor
MSH	Management Sciences for Health
NMP	National Medicines Policy
NGO	Nongovernmental organization
ORS	Oral rehydration solution
ORT	Oral rehydration therapy
PHC	Primary care facility or health centre
SEARO*	WHO Regional Office for South-East Asia
STG	Standard treatment guidelines
URTI	Upper respiratory tract infection
USAID	United States Agency for International Development
WHO	World Health Organization
WPRO*	WHO Regional Office for the Western Pacific

* WHO Regional Offices were used to group countries for purposes of regional data summary and analysis.

SUMMARY OF KEY POINTS

Background

Inappropriate use of prescription medicines is a global problem with serious consequences for patients in terms of poor health outcomes, increased adverse drug events, accelerating rates of antimicrobial resistance, spread of blood-borne infections due to non-sterile injections, and waste of scarce health resources.

Many countries have adopted National Medicines Policies and Essential Medicines Programmes that include components to promote more appropriate use of medicines. However, these efforts are often haphazard and their impacts have rarely been thoroughly evaluated. One reason for this may be a lack of evidence about the seriousness of the problem of inappropriate use of medicines and about the effectiveness of various small-scale interventions that have been tested to improve medicines use.

Objective

The objective was to undertake a systematic, quantitative review of studies published between 1990 and 2007 about medicines use in developing and transitional countries, and to assess the impact of interventions undertaken to improve use.

Methods

WHO created a database of studies on the use of medicines in primary care in developing and transitional countries. The database includes systematically extracted quantitative information on commonly used indicators of medicines use measured in these studies as well as details on study setting and methodology extracted from published and unpublished articles and reports. In addition, the database also contains information on any intervention implemented to improve use of medicines reported in these studies.

All studies published during 1990-2006 reporting quantitative data on medicines use at the primary care level were eligible to be included in the database. To identify studies, we searched various sources likely to contain studies of interest, including the International Network for the Rational Use of Drugs (INRUD) Bibliography on medicines use,[1] Embase, PubMed, and the archives of WHO departments concerned with medicines and child health; we also contacted other agencies involved in primary care and medicines programmes for reports of medicines use studies. To be included in the database, studies had to report quantitative data using common medicines use indicators, including the WHO/INRUD indicators[2] and the WHO IMCI indicators.[3] All articles identified for possible entry into the database were reviewed by two authors (KH, VI). One author extracted and entered information about the study and the reported data on medicines use into the database and the other checked all entries.

A Microsoft Access© database was created to record the extracted data. As far as possible, the database contains one record per study group (i.e., a specific type of health provider practicing in a specific sector or setting); intervention studies contain data on the characteristics of each of the individual study groups identified by the intervention design. Data from the same study reported in multiple articles were only entered once. Articles that reported data separately from multiple countries or results for different types of health facility or prescriber were entered into the database as separate records. Study patient populations were characterized by age, treatment location and disease.

This review contains results from all studies in the database published up to the end of 2006, with some additional studies on the Integrated Management of Sick Children (IMCI) from 2007. We converted the Access database into SAS© to assess data quality and to conduct statistical analyses. We calculated the median value of each indicator of interest across all studies reporting the indicator, by year of data collection, region, country income, facility ownership, and prescriber type. The final data set was converted to Microsoft Excel© to create graphs and tables.

Studies that reported the impacts of interventions or policies intended to improve use of medicines were categorized by type of intervention. We assessed the methodological quality of the research designs of these studies and limited analysis of intervention impacts to studies that met commonly accepted standards of adequate study design (randomized controlled trials, time series with or without comparison series, and pre-post with control). Two methods were used to summarize the effects across studies. The first method compared the largest reported improvement in a key medicines use outcome that was targeted by the individual authors. The second method calculated a composite indicator of improvement for each study by calculating the median effect across all outcome measures reported in the main category of outcomes targeted by the authors; prescribing practices were the major outcomes targeted in over 90% of studies, although some also targeted measures of patient care or mortality.

Results

We identified and entered data from 679 studies conducted in 97 countries into 856 records in the database. For the 711 database records (representing 559 studies) where the institutional setting could be determined, a large majority (71%) were undertaken in the public sector, with 29% conducted in the private sector (26% in the private for-profit settings and 3% in private not-for-profit settings). Only 13% of studies looked at medicines use in pharmacy shops and only 2% at medicines use in non-licensed shops even though private medicine retailers account for the majority of medicine transactions in primary care in many developing countries.

Changes in medicines use over the past 25 years have been variable. In all regions, less than half of all patients were treated according to clinical guidelines for common diseases in primary care. The treatments of acute respiratory tract infection and malaria have not improved considerably over time; treatment of diarrhoea, while still deficient, shows some improvement. Less than 60% of pneumonia cases were

treated with an appropriate antibiotic, and more than half of all cases of upper respiratory tract infection received antibiotics, most of them unnecessarily. Less than 60% of children with diarrhoea received oral rehydration therapy, and more than 40% received antibiotics, again mostly unnecessarily. Only about half of all malaria cases received an appropriate antimalarial. An encouraging sign is the increase in the use of generic and essential medicines in the public sector.

The use of medicines in the public sector was substantially better than in the private sector for WHO/INRUD prescribing indicators and also for the treatment of ARI, diarrhoea and malaria. By contrast, in the private sector, there were longer consultation times, better labelling, and better patient knowledge of dosing. Prescribing by paramedical and nursing staff was as good as that of doctors for the practices measured by the WHO/INRUD indicators and with regard to the treatment of acute respiratory tract infection, diarrhoea and appropriate use of antibiotics.

Although 386 separate interventions were evaluated in 313 studies, only 121 of them were adequately evaluated in 81 studies. The evidence base about intervention effects has grown slowly and the proportion of studies using acceptable research designs has not improved over time. The situation is particularly critical for interventions to improve use of medicines among children, where a very small proportion of studies contribute to knowledge about intervention effectiveness.

The most frequent types of interventions evaluated have been educational programmes for health providers, half of which were implemented in conjunction with educational programmes for patients or consumers. An increasing number of studies have evaluated the impact of enhanced supervision, frequently accompanied by routine monitoring of prescribing practice. Many surveys have been conducted during the implementation of National Medicines Policies, Essential Medicines Programmes, or other national policies, but their uncontrolled, cross-sectional designs provide virtually no evidence to support the positive effects of these policies on appropriate use of medicines.

The most effective interventions in terms of largest positive effects on medicines use outcomes have combined multiple intervention components, especially those characterized by enhanced health worker supervision combined with provider and consumer education. Interventions that involve a group educational process for health workers have also had consistently positive effects. Community case management is another example of a successful multi-component strategy targeting paediatric mortality. National medicines policies, regulation and printed materials are examples of interventions with limited evidence of impact.

Conclusions

Inappropriate use of medicines continues to be a widespread problem in developing and transitional countries. Based on reports published between 1990 and 2006, prescribing and patient care practices did not exhibit much improvement. Since most studies included in this review were conducted in the public sector where use of medicines is generally thought to be better than in the private sector, it is likely that

the overall situation is worse than reported. Since the majority of health care is undertaken by the private sector in many countries, including both for profit and non-profit providers of care, there is an urgent need to conduct more studies to measure quality of medicines use in this sector.

We found that only 121 of 386 interventions were evaluated using valid study designs, indicating the paucity of both reported experience with interventions as well as limited evidence about their effectiveness. However, the limited results are generally similar to those from industrialized countries. Multi-faceted interventions involving both education and managerial systems have tended to be more effective than those that employ one strategy only. Countries need to extend the range of interventions tested, especially in the private sector, as well as to examine the impacts of scaling up interventions shown to be effective in small-scale studies. Promising approaches include interventions that have multiple components, especially those that include some type of enhanced supervision or group process strategies.

The creation of the medicines use database has allowed the first systematic quantitative review of studies measuring medicines use indicators in developing and transitional countries. Nevertheless, the database and our analyses have several limitations. The database is limited to reports of medicines use practices thought important enough to be assessed; it is probably not representative of all medicines use problems in developing countries and it excludes all data from industrialized countries where more is known about use of medicines and intervention effectiveness. While we stratified studies of medicines use practices by important categories (geographic region, country income, health facility ownership, type of prescriber), the data were too sparse to conduct more elaborate statistical analyses. We used the median result within a group as the most representative expression of practice and we did not weight studies, adjust results for factors that influence medicines use over time, or adjust for clustering of studies in a particular region or population. For some indicators, time points, and subgroups, the number of studies is small and the data more uncertain.

These limitations notwithstanding, the evidence presented in this report about continuing problems in use of medicines is compelling and should be used to advocate for greater investment by all stakeholders in promoting appropriate use of medicines.

1. INTRODUCTION

1.1 Background

Rational use of medicines requires that patients receive medications appropriate to their clinical needs, in doses that meet their requirements, for an adequate period of time, and at the lowest cost to them and their community.[4] Unfortunately, more than 50% of all medicines are prescribed, dispensed, or sold inappropriately on a global basis and 50% of patients fail to take their medicines correctly according to estimates based on various ad hoc reviews.[5] Common types of inappropriate medicines use include polypharmacy (the use of too many medicines per patient), overuse of injections, inappropriate use of antimicrobials, failure to prescribe in accordance with clinical guidelines, and inappropriate self-medication, often with prescription-only medicines.

Inappropriate use of medicines is harmful for patients in terms of poor patient clinical outcomes and avoidable adverse drug reactions. Overuse of antimicrobials exerts pressure to increase rates of antimicrobial resistance. Non-sterile injections contribute to the transmission of hepatitis, HIV/AIDS and other blood-borne diseases.[6,7,8] Inappropriate medicines use wastes scarce economic resources that could be used for food or other necessities. Unnecessary overuse of medicines can stimulate inappropriate patient demand[5] and lead to medicine stock-outs and loss of patient confidence in the health system.

1.2 Working towards rational use of medicines

Much has been done in the past 20 years to improve the use of medicines. The present definition of rational use of medicines was agreed at the international conference of experts in Kenya in 1985 and endorsed by a World Health Assembly Resolution in the following year.[4] The International Network for the Rational Use of Drugs (INRUD) was formed in 1989 with the objective of undertaking multidisciplinary intervention research to promote appropriate use of medicines in developing countries.[9,10] INRUD core groups from many countries in Africa and Asia participated in the development of the WHO/INRUD indicators to investigate medicines use in primary care facilities, which have formed the basis for measurement in many studies conducted since that time.[2] INRUD groups also spearheaded the testing of many innovative intervention studies to improve use of medicines.

In 1997, the first International Conference on Improving Use of Medicines (ICIUM) was held in Chiang Mai, Thailand, to review global experience in this field and to define future directions in developing countries.[11] A review presented at the conference of all published studies of outpatient use of medicines with adequate study design revealed that interventions to improve use of medicines could be successful and that impacts varied by intervention type.[12] Printed materials alone had little impact on improving practice. Greater effects on medicines use were associated with improved supervision, audit and feedback of practice, group process,

and community case management. The effects of training, the most common type of intervention, were variable and often unsustained, probably due to differences in training quality and the absence of follow-up after a time-limited educational process.

Based on the evidence about problems in medicines use and effective interventions presented at ICIUM 1997, WHO developed recommendations for twelve core national policies and structures that are needed to promote appropriate use of medicines (**Table 1.1**).[5]

Table 1.1: Twelve core interventions recommended by WHO to promote more appropriate use of medicines

1. A mandated multi-disciplinary national body – to coordinate medicines use policies.
2. Evidence-based clinical guidelines – to aid prescribers on how to treat patients.
3. Essential medicines lists based on treatment of choice – to be followed in procurement and distribution of medicines.
4. Medicines and therapeutic committees – to monitor quality of care in the districts and hospitals under their jurisdiction.
5. Problem-based pharmacology training in undergraduate curricula – to better equip future doctors in how to prescribe.
6. Continuing in-service medical education as a licensure requirement – in order to ensure that prescribers remain up-to-date with new treatments.
7. Supervision of health-care workers, audit of prescribing and feedback to prescribers – in order to help prescribers use medicines more appropriately.
8. Provision of independent information (such as clinical guidelines, drug bulletins) on medicines – in order to make sure that prescribers have sufficient unbiased information on medicines.
9. Public education about medicines to try and reduce inappropriate self-medication and demand for medicines and also to increase awareness about the importance of adherence.
10. Avoidance of perverse financial incentives such as prescribers earning money from the sales of medicines which encourages over-prescription of medicines.
11. Appropriate and enforced regulation, particularly concerning medicine promotional activities by the pharmaceutical industry, licensing of medicine outlets and health-care workers, and the availability of prescription-only medicines without prescription.
12. Sufficient government expenditure to ensure availability of medicines and staff.

In 2004, the second ICIUM Conference was held, again in Chiang Mai, Thailand.[13] Review of the evidence presented highlighted that inappropriate use of medicines continued to be widespread, with serious health and economic implications, especially in resource-poor settings. While examples of many effective interventions were presented at ICIUM, global progress had been confined primarily to small-scale demonstration projects. Experts at ICIUM 2004 emphasized an urgent need to move from small scale research projects to large-scale sustainable programmes that achieve public health goals through appropriate medicines use. Conference participants made three major recommendations supporting effective national efforts that improve the use of medicines on a large scale and in a sustainable manner.

- Countries should implement National Medicines Programmes to improve medicines use, covering both the public and private sectors and including in-built monitoring systems;
- Successful pilot level interventions should be scaled up and their impacts regularly monitored;
- More interventions should target medicines use at the community level, particularly with regard to school programmes, medicine sellers, treatment of chronic diseases and the regulation of promotional activities.

Following ICIUM 2004, there was much concern about the continued inappropriate use of medicines and the failure to take action at the global level. These discussions culminated in the adoption of resolution WHA60.16 entitled *Progress in the resolution on rational use of medicines* at the World Health Assembly in May 2007.[14] The resolution calls for a cross-cutting, sector-wide policy approach to health systems to promote rational use of medicines.

To promote more appropriate use of medicines, it is useful to summarize current and historical patterns of medicines use reported in the literature. Such data can be useful in advocacy, programme planning, and evaluating medicines policy and programme changes. These data can also provide insight into how medicines use patterns compare across countries and regions, whether medicines use improves over time, and which strategies are successful in improving use. Based on such information, countries can set priorities and develop a coherent strategy to improve use of medicines. The need for monitoring data on use prompted the creation of the WHO database on medicines use studies. Findings from studies in the database that are summarized in this document provided much of the evidence presented to the World Health Assembly prior to adoption of resolution WHA60.16.

1.3 Overview of this report

This document summarizes available historical data on patterns of medicines use from all relevant studies conducted prior to the end of 2006 that were reported up to the end of data collection in 2006 (with all studies on integrated management of childhood illnesses that were reported in 2007). In Chapter 2, we describe the structure of the WHO medicines database and the methods used to summarize the information included in this report. Chapters 3 to 5 provide summaries of studies on general medicines use indicators, while Chapters 6 to 9 provide summaries of indicators for studies of specific diseases (acute respiratory infection, diarrhoea, malaria) and medicines use problems (antimicrobial use). Chapter 10 summarizes the types of interventions that have been conducted to improve medicines use, and assesses the relative impact of different types of interventions. Chapter 11 discusses the findings in the light of the important limitations in collecting and analysing the data and recommends next steps.

Annex 1 contains tables with detailed data corresponding to all of the figures presented in Chapters 3 to 9, while Annex 2 presents key descriptive indicators with countries classified by WHO region rather than by World Bank region which is used in the body of the report. Annex 3 contains the manual describing details of the

construction of the WHO database, extraction of data from publications and reports, and coding of all variables in the database.

We hope that this summary of data from the WHO medicines use database will be useful in providing information to build future global and national strategies to promote appropriate use of medicines. Stakeholders are encouraged to use the data presented in this report and its Annexes to summarize data relevant to their interests. To ensure the availability of up-to-date information on medicines use and the effects of interventions, the WHO database will require regular updating and maintenance.

2. METHODS

2.1 Objectives of the WHO database on medicines use

The WHO database of reports on medicines use in developing and transitional countries was created with the following overall objectives:

- To provide a general overview of patterns and trends in medicines use in primary care since 1990, and
- To summarize experience with testing interventions and assess the impact of different types of interventions on use of medicines.

A developmental version of the WHO database was presented at ICIUM in 2004.[15] Following ICIUM 2004, the database was completed with studies that were conducted up to the end of December 2006. Because of continuing interest in assessing the impact of various strategies for integrated management of childhood illnesses (IMCI), we added recent IMCI studies published in 2007 to the database.

2.2 Steps to create the database

We undertook the following steps to develop the WHO database on medicines use:

- Designed a database of key variables in Microsoft Access;
- Developed criteria for inclusion and a search and retrieval strategy for articles;
- Developed rules for data extraction and entry, all of which are described in the database manual in Annex 3;
- Extracted the data, entered them into the database, double checked each record, and resolved discrepancies for each report that met the inclusion criteria.

2.3 Database format and design

The database uses Microsoft Office® Access 2003 (Microsoft Corporation, Redmond, WA). To construct a database comparable to other WHO databases, we used WHO standardized codes for countries, regions and years. Scanned images of the database sections and descriptions of all database fields are included in Annex 3. The database consists of four sections:

- **Section 1** contains fields for demographic and publication details of each study, including the country and year of survey; the health-care setting; the type of prescriber, dispenser, patient and diseases; and whether any intervention to improve medicines use was undertaken as part of the study. Detailed instructions about how to code these fields using drop-down menus are given in the database manual. This section also includes full citations for up to three reports or published articles from which the data for the study were extracted.
- **Section 2** contains fields collecting information about any interventions conducted in conjunction with the study. Interventions have been grouped into nine major types: provider education; consumer education; administrative or

managerial strategies; community case management; printed materials; group process strategies; regulatory interventions; economic strategies; and Essential Medicines Programmes, including medicine supply strategies. Intervention fields use yes/no responses to indicate whether specific features were part of an intervention. In addition, there are three open-ended fields in which up to three different interventions conducted as part of the study can be described in more detail.

- **Section 3** contains fields for methodological details of data collection. This section collects information about the quality of the data reported in the study and whether the study design was sufficiently robust to draw inference about intervention impacts. Relevant information includes study design, data collection methods, and sample sizes for patients, providers and health facilities. Detailed instructions about how to summarize sample size information are given in the database manual.

- **Section 4** contains fields for quantitative data on indicators of medicines use. This section includes about 50 commonly reported indicators from which to choose, including the standard WHO/INRUD core and complementary indicators on medicines use;[16] medicines use indicators associated with specific diseases such as ARI, malaria and diarrhoea;[16,17,18,19] the standard IMCI indicators;[17] and mortality rates for all causes or in association with specific diseases that are often reported in community case management studies. The most frequently reported indicators are shown in Table 2.1. For each indicator, data were entered on the observed indicator value, the date the indicator was measured, and for intervention studies, when the value was measured in relation to the intervention (at baseline, during the intervention, or at up to 3 follow-up assessments) and the study group to which it referred (i.e., the control group or a specific intervention group).

The database manual in Annex 3 details the definitions (including the numerators and denominators) of each indicator captured in the database. It also gives instructions on how to calculate outcome values for some indicators in situations where an article does not present data in a format that the database can accept, but where there are sufficient data to enable calculation of the indicators used in the database. A frequently occurring example of this is where data are presented for individual health facilities but not averaged across facilities.

Table 2.1: List of selected medicines use indicators for the WHO database

WHO/INRUD medicines use indicators for primary care facilities [16]

Prescribing indicators

1. *Average number of medicines prescribed per patient encounter*
2. *Percentage of medicines prescribed by generic name*
3. *Percentage of encounters with an antibiotic prescribed **
4. *Percentage of encounters with an injection prescribed*
5. *Percentage of medicines prescribed from an EML or formulary*

Patient care indicators

6. *Average consultation time*
7. *Average dispensing time*
8. *Percentage of medicines actually dispensed*
9. *Percentage of medicines adequately labelled*
10. *Percentage of patients with knowledge of correct dose*

Facility indicators

11. *Availability of EML or formulary to practitioners*
12. *Availability of clinical guidelines*
13. *Percentage of key medicines available in a facility*

Complementary medicines use indicators

14. Average medicine cost per encounter
15. *Percentage of prescriptions in accordance with clinical guidelines*

Disease-specific medicines use indicators

ARI treatment indicators

16. *Percentage of pneumonia cases treated with recommended antibiotics*
17. *Percentage of cases of upper respiratory tract infections treated with antibiotics*
18. *Percentage of cases of acute respiratory infections treated with cough syrups*

Diarrhoea treatment indicators

19. *Percentage of cases of diarrhoea treated with antibiotics*
20. *Percentage of cases of diarrhoea treated with antidiarrhoeals*
21. *Percentage of cases of diarrhoea treated with oral rehydration therapy (ORT)*

Malaria treatment indicator

22. *Percentage of cases of malaria treated with recommended antimalarials*

Additional indicators

23. Percentage of patients receiving medicines without prescription
24. Percentage of cases prescribed multivitamins/tonics
25. Percentage of injections prescribed inappropriately
26. *Percentage of patients prescribed antibiotics inappropriately*
27. *Percentage of antibiotics prescribed in too low dose*
28. Percentage of cases of pregnant woman treated with iron and/or folic acid

* As defined by individual authors; the widely used WHO/INRUD indicator methodology excludes anti-protozoal agents and antimicrobials primarily used to treat tuberculosis or malaria.

Italicized indicators are reported in the present fact book.

2.4 Search strategy and criteria

All relevant studies on use of medicines were identified using both published articles and unpublished reports for the period 1990-2006, with the addition of IMCI studies published in 2007.
The search strategy included:

- A search for published studies referenced in the INRUD bibliography on medicines use.[20] The INRUD bibliography is updated every 6 months by searching PubMed[21] and over 50 journal tables of contents for publications relevant to medicines issues. We reviewed every abstract listed in the INRUD bibliography reporting on work in a developing or transitional country retrieved using the keywords "drug use", "drug utilization", "drug therapies", "prescriptions", "antibiotics", "diarrhoea", "acute respiratory infections", "malaria", "interventions", "evaluation studies", "education" and "developing countries".
- Additional PubMed and Embase searches, using the keywords "drug use/utilization", "medicines use/utilization", "prescribing", "integrated management of childhood illness", "developing countries", "Africa", "Asia", "Central America" and "South/Latin America".
- Studies conducted by the Rational Pharmaceutical Management Project of Management Sciences for Health and other USAID development partners, and found in their archives.
- Studies from the archives of the WHO Department of Child and Adolescent Health on control of diarrhoeal diseases, respiratory infections, and integrated management for childhood illness (IMCI).
- Country reports from the WHO Essential Medicines Documentation Centre , such as WHO consultants' reports, documents from the ministries of health, master and doctoral theses from university students, studies on injection practices, NGO reports, project proposals, and others.
- Reports from WHO Level II Indicator Pharmaceutical Surveys implemented by the WHO Department of Technical Cooperation for Essential Drugs and Traditional Medicine.[18]
- Studies from the Joint Research Initiative on Improving Use of Medicines (JRIIUM) of WHO, Harvard Medical School, Boston University and Management Sciences for Health.
- Hand searches of key journals including Cahiers Santé, Health Policy and Planning, and Tropical Medicine and International Health.

In addition, we reviewed all studies presented at the 1st and 2nd International Conferences for Improving the Use of Medicines in 1997 and 2004, respectively, and sought publications or reports of these studies from the authors. However, studies that were only reported in abstract form at the conferences with no supporting documentation were not included.

A study was included in the database if it was from a developing or transitional country and if it contained quantitative data describing medicines use in a primary care setting using standardized indicators. Developing/transitional countries were defined as all countries excluding those from Western Europe, the USA, Canada, Japan, Australia, and New Zealand. Primary care settings included primary care clinics, hospital general and paediatric non-specialist outpatient settings, pharmacies, medicine shops and households. Studies were considered if they were published during 1990-2006 (as found in searches conducted until December 2006) or IMCI studies published in 2007, written in English, French, Spanish, Portuguese and Russian, and had full-text reports (rather than abstracts only) available for review.

Relevant articles and reports were obtained using the WHO library, on-line journals, and other external library resources. In addition reports were retrieved from the WHO Essential Medicines Documentation Centre, the Departments of Child and Adolescent Health and Technical Cooperation for Essential Drugs and Traditional Medicine in WHO, the MSH Rational Pharmaceutical Management Project, individual authors, and their respective organizations.

The search and retrieval strategy was tested by comparing the articles found using the database search strategy with selected reference lists provided by the Child Adolescent Health Department of WHO, the Harvard Medical School Drug Policy Research Group, and the U.S. Centers for Disease Control in Atlanta.

2.5 Data entry

A main principle for design of the database and data entry was to enter individually identifiable data for each predefined study population, as defined by (1) health facility ownership [public, private for-profit, private not-for-profit]; (2) setting [primary care centre, hospital, chemist, household]; (3) prescriber type [doctor, paramedic, other], (4) and dispenser type [pharmacist, pharmacy assistant, other]; (5) patient type [outpatient, consumer], and (6) year of data collection. The database manual in Annex 3 contains definitions of the study population categories.

We defined each record in the database as "quantitative data on medicines use by a specific medicines user in a specific country in a specific time period." Each database record relates to just one country; studies reporting data from multiple countries have been entered as separate records for each country. Data reported in individual articles/reports were entered into the database as separate records according to the number of groups studied, as characterized by unique combinations of medicine outlet ownership; medicine outlet type; prescriber type; patient type (outpatient, consumer) and time period. Data from multiple articles related to the same study or involving populations from the same setting were assigned a common study identification number and only one database record was created per country and setting.

Articles were not divided into different records on the basis of patient age or disease type. If an article reported medicines use by more than one criterion used to define setting (e.g. health facility type and prescriber type) the researchers selected one

category for a record in the database. The choice of category depended on the quality of the data reported and the objectives of the study. No data point was entered twice into the database. In addition, some studies are described in more than one article or report, in which case up to three references have been entered in the database to cite the particular study but were not counted as different studies.

2.6 Data cleaning

Abstracts of all identified reports were screened by one researcher, the second researcher reviewed a random selection of abstracts to ensure agreement about whether the full article should be retrieved. All articles retrieved were reviewed by two researchers, whether or not entered into the database. Of the retrieved articles, only those found to have no quantitative medicines use data were not entered into the database. One researcher entered the data and each entry was reviewed by the other researcher for accuracy. In addition, we exported the data into Excel (Microsoft® Office® Excel 2003, Microsoft Corporation, Redmond, WA) and created frequency distributions of key variables to assess data entry accuracy.

2.7 Definitions, variables, and data sources

For the analyses reported here, we adopted the following conventions and definitions:

- A *publication* (n=726) is any published or grey literature source of data in the WHO medicines use database.
- A *database record* (n=856) contains an array of descriptive information and quantitative data on medicines use pertaining to a specific country; health setting; prescriber, dispenser, or patient group; and time period.
- A *study* (n=679) consists of the total set of data pertaining to a specific country, setting, study group, and time period. A study can contain data extracted from more than one publication or report, and entered in more than one database record. For intervention studies, a study may also consist of data for different time periods before, during, or after the same intervention.
- A *data point* (n=5958) is defined as a measurement of a specific medicines use indicator at a specific point in time. Data points are measures of one indicator at a particular point in time for a specific provider in a specific setting.
- A *study group* in descriptive analyses is a category based on a unique combination of health facility ownership [public; private for-profit; private not-for-profit; not identified] and setting of care [hospital/primary care; pharmacy/drug shop; household; not identified]. In analyses of differences in medicines use by prescriber type [doctor, paramedic/nurse, other], this variable is also used to differentiate study groups.

When several data points were reported from the same study for the same study group in a given time period, only their mean value was used in descriptive analyses. For example, if an intervention study reported different baseline values of an indicator for a control group and two intervention groups, all of which

represented prescribing in the public sector, these values were averaged into a single data point prior to the descriptive analysis. This procedure avoided giving too much emphasis to a large amount of data points for the same indicator from interventions that have several similarly defined groups or studies in settings that have been evaluated intensively.

Furthermore, in studies that present trends in medicines use over time, no study group was allowed to contribute more than one data point in a given time period. For example, when multiple measures were reported for the same study group within a time period (e.g., for baseline and follow-up measures of the same indicator that both occurred in the same period), these were averaged into a single data point for descriptive analyses.

A study could contribute multiple data points for a specific time period for study groups that were not identical, for example, public and private sector facilities or, in analyses of differences by prescriber type, for physician and non-physician prescribers. We justify using multiple data points in a time period from studies reporting data in differently defined study groups by the fact that patterns of medicines use tend to differ greatly by health facility ownership and setting of care.

2.7.1 Data sources for descriptive analyses

We used the following data sources to generate data points for the descriptive analyses: data from any study that did not report on an intervention; data from the baseline period of intervention studies; data from control groups of intervention studies in all follow-up periods; and data from cross-sectional surveys that were coded as post-only cross-sectional interventions because they followed implementation of disease management or IMCI programmes.

2.7.2 Data sources for intervention analyses

All studies describing an intervention were included in the overall description of intervention studies. Only data from intervention studies with valid study designs (randomized controlled trials; interrupted time series studies with or without comparison groups; and pre-post studies with a control group) were included in the statistical analysis of intervention effects.

When intervention studies reported multiple post-intervention assessments, we used the last post-intervention data point reported, for calculating study effects.

2.8 Data analysis

We exported the Access database into an analytic relational database in SAS (SAS Institute, Inc, Cary, NC). We conducted descriptive analyses of key descriptive study variables. Values of each medicines use indicator from each study were summarized by calculating medians and 25th and 75th percentiles across studies that reported that indicator, overall and for studies that reported on medicines use in specific provider, facility and patient groups.

We conducted sensitivity analyses to determine the impact of excluding data points from the analyses of descriptive studies of cross-sectional studies of disease management and IMCI programmes, as some might argue that these describe patterns of medicines use after an intervention has occurred (although in these studies, the interventions cannot be clearly defined). Exclusion of cross-sectional studies of disease management and IMCI programmes (n=89) did not materially change the results and the analyses presented in this Fact Book includes these studies.

2.8.1 Baseline analysis of medicines use indicators

The following descriptive analyses were carried out for each indicator:

- Trends in medicines use over time.
- Trends in medicines use by World Bank and WHO regions.
- Trends in medicines use by World Bank country income category.
- Medicines use in the public versus private sectors.
- Medicines use by doctors versus paramedical staff and nurses.

The results in this report are presented as line charts, bar charts and pie charts. We often present a group of relevant indicators in a graph to enable readers to compare changes or differences in indicators of desired and undesired medicines use practices. Only summary data points with a sufficient number of studies on which to base a median value (defined as a minimum of at least 4 studies) are included in the figures presented in the text of the Fact Book. Annex 1 contains the median values of the indicators depicted in the graphs, and additional data elements (the number of studies used in calculating the median, as well as the 25th and 75th percentiles of the distribution).

2.8.2 Intervention impact analysis

Additional analyses were conducted to evaluate the impact of interventions. For these analyses only studies using adequate methodology were included. Acceptable study designs consisted of randomized controlled trials, interrupted time series with or without comparison group(s), and pre-post studies with one or more control groups. For the time series design, a minimum of four time points were required, one to summarize the pre-intervention value and three to capture post-intervention values. Studies using a post-only with control design or pre-post with no control study design were excluded from the intervention impact analyses.

The rates of prescribing practices were the primary outcomes of interest. Mortality rates are also used as the primary outcomes of interest for community case management interventions. A major aim of the analysis was to draw basic conclusions about both the quality of research evidence and the relative effectiveness of different intervention strategies in improving prescribing. We followed the method developed by Ross-Degnan and colleagues in their review of improving use of medicines for the first International Conference for Improving the Use of Medicines (Ross-Degnan et al. 1997, unpublished and WHO 1997[22]). The method

summarizes relative effect sizes of all interventions, in the face of relative paucity of studies and variation in environments, strategies, target audiences, practices and outcomes used.

To evaluate each intervention, focus was given to the outcome measures identified by the authors as the principal targets for their interventions, as well as to the single measure with largest positive change in terms of better medicines use, e.g. a reduction in antibiotic use for acute diarrhoea or viral upper respiratory tract infection or an increase in compliance with standard treatment guidelines. For most studies, outcome measures included indicators of appropriate prescribing, such as antibiotic use, injection use or adherence to clinical guidelines; some studies also included patient care indicators, such as consultation time or patient knowledge about how to use dispensed medications. A number of studies were designed to improve use of medicines for malaria, pneumonia, or diarrhoea in order to reduce mortality; these studies, in which mortality rates are the key outcome measures, are excluded from most summaries of intervention effects. All outcome measures were converted to a scale where positive change was indicated by positive numbers.

For each of the outcome measures identified as relevant, an effect size was calculated. If the outcome was measured as a percentage, the effect size was computed as the relative gain in the intervention group, i.e. the percentage-point improvement, of the intervention group over the percentage point improvement in the comparison group. For time-series with no control, the effect size was the net difference between the last post-intervention value reported and pre-intervention value. If the outcome was measured as a number (e.g. average number of medicines per patient), the changes (from pre-intervention to post) were converted to percentage improvements in each group by dividing the absolute changes by baseline values. The calculation of effect sizes for each type of outcome measure was carried out as follows:

For percentage outcome measures:

$$Effect\ Size = (\%Post\text{-}\%Pre)_{Intervention} - (\%Post\text{-}\%Pre)_{Control}$$

For numeric outcome measures:

$$Effect\ Size = ([Post\text{-}Pre]/Pre)_{Intervention} - ([Post\text{-}Pre]/Pre)_{Control}$$

To indicate an intervention's magnitude of effect, two approaches were taken. First, the single outcome measure showing the largest positive change (in terms of better medicines use) was used and comparisons were made across all relevant studies and interventions. Secondly, since one single indicator may not adequately reflect the actual overall impact of an intervention, a composite indicator was calculated by taking the median effect within a study across all of the indicators measured and then using these study-specific medians for summary comparisons across studies.

2.9 Limitations

An ideal study of patterns and trends in medicines use would consist of a probability sample in time and place of prescriptions and analyses that account for the sampling

method and provide confidence intervals around results. A second best study approach might be a formal meta-analysis of existing studies that would need to be reasonably representative and homogenous in methodology. Neither the ideal study nor a meta-analysis of studies on medicines use in developing countries is currently feasible.

The present report constitutes a practical approach to assessing medicines use in primary care by compiling information from existing reports. However, both the collection of data entered in the database and the analytic approaches to analysing these data have notable limitations.

2.9.1 Limitations of the data collection

The WHO database of reports on medicines use is not entirely representative of medicines use in developing and transitional countries. While much effort was made to find all existing published and unpublished reports on medicines use in developing and transitional countries during the past 25 years, we have undoubtedly not found all. The database is likely lacking many unpublished studies conducted at country level as well as many interventions carried out and evaluated in countries, such as training, formularies, bulletins and supervision, which were not evaluated or reported. Even if we had retrieved all evaluations of medicines use ever conducted, the results would not necessarily reflect country situations, since medicines use studies happen selectively in specific settings.

The data may also not be completely accurate. Extraction of quantitative data from articles and reports was often very difficult due to the following types of problems:

- Some studies were published in more than one article, sometimes with inconsistent results.
- Standard indicators were often not used.
- Certain data were sometimes missing, particularly study year, facility type, facility level and prescriber type.
- Data were sometimes difficult to classify due to indicators being poorly described, medicines use being reported for a mix of facility/prescriber type (and not separately), or poorly described study designs which were not consistent with the results presented, e.g., an interrupted time-series design was stated but data points in segments were not described.
- Qualitative information from "retrospective" interviews and observations were reported without adequate explanation of what really occurred.
- Additional analyses of study data were necessary based on certain assumptions in order to enter summarized data into the database (see Annex 3).
- Descriptions of interventions often lacked detail, and it was difficult to distinguish clearly between different strategies. For example, the IMCI strategy always included training, but the type of training and the degree of supervision varied.

A great effort was made to abstract data from articles as accurately as possible and to give a true description of all studies entered into the database. For every open question an attempt was made to contact the study authors. However, only a minority of authors responded.

2.9.2 Limitations of the data analysis: Description of medicines use

Our analyses are descriptive and do not take variability of data or potential confounders properly into account. Medicines use indicators differed over time and by sector, facility and prescriber characteristics. To avoid modelling mean (rather than median) indicator values (which are unduly influenced by outliers), we did not conduct multivariate regression analyses. We stratified by key sector, facility and prescriber characteristics, but did not simultaneously control for differences in all characteristics. Therefore apparent differences in performance between groups on one or more indicators may be due to multiple factors.

We did not weight study results by study size to avoid undue influence of large studies; in other words, each study became a single data point with equal weight, without regard to sample size and variance. We do not provide statistical estimates of differences between groups since variance would be greatly underestimated.

Due to generally large sample sizes, the median indicator results across studies were less prone to biases due to extreme values. In cases where sample sizes amounted to fewer than four studies per group for a given indicator, we excluded the data point from any graphic presentations. However, all summary data are reported in Annex 1.

2.9.3 Limitations of the data analysis: Evaluation of interventions

A major limitation to the evaluation of intervention studies is their heterogeneity with respect to the nature of the interventions studied, the settings of the interventions, and their specific targets. In the light of these uncertainties, effect size comparisons are tenuous and should be used as a basis for further careful experimental comparisons of intervention methods in specific settings.

3. DESCRIPTION OF STUDIES

3.1 Results of search in published and unpublished literature

Abstracts and executive summaries were screened from 7824 articles from the INRUD bibliography (16 December 2007) and all the reports in the documentation centres of the Departments of Essential Medicines and Child and Adolescent Health in WHO. In addition, various discrete searches were undertaken as described in section 2.4. Of all the complete articles retrieved, 404 articles were found to have no relevant data that could be extracted. For the period 1990-2006 (as of December 2006), 679 studies from 97 countries were identified and entered into the database as 856 database records. A third of the studies investigated medicines use in children less than 5 years old, and 312 of 679 studies (46%) were done in association with evaluating an intervention (including those of both good and poor study designs for evaluation).

3.2 Cross-sectional studies of medicines use and patient care

Cross-sectional studies of medicines use and patient care identified by the criteria described in Section 2.4 were organized by periods of data collection. Because of the small number of earlier studies, the first 10 years were grouped together into one period, with subsequent years grouped into three-year periods.

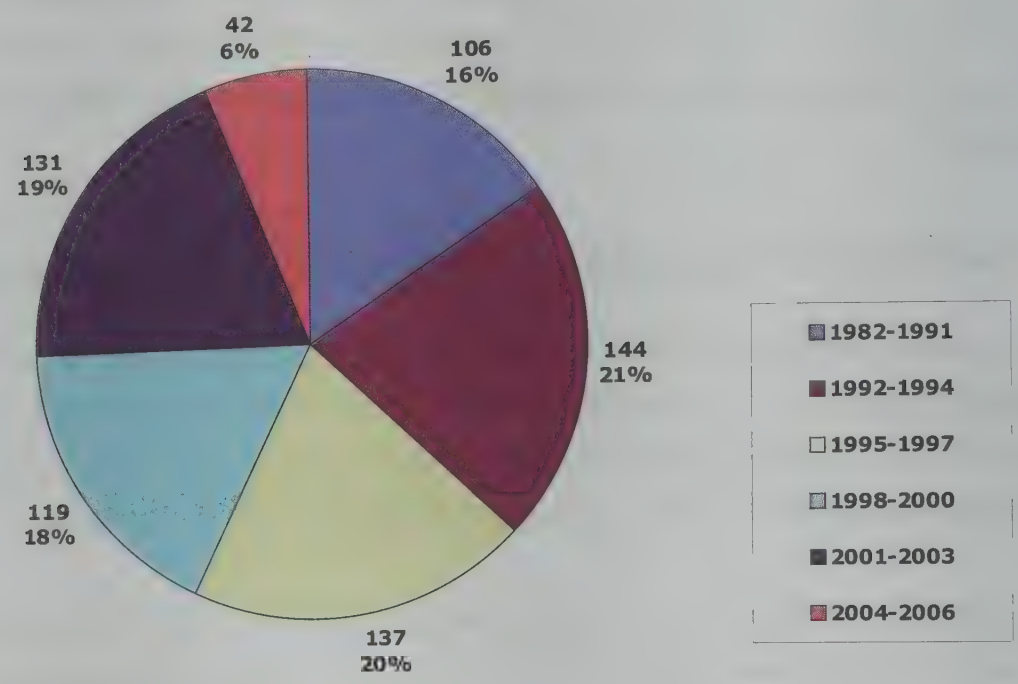
Studies were also organized by geographic origin. India had the largest number of studies with 60, followed by Nepal with 35, the United Republic of Tanzania with 24, and Uganda with 23 studies. We classified studies geographically in two ways, one using WHO regions, the other using World Bank regions. Studies were also organized by the economic level of countries where they were conducted, using the World Bank classification based on 2006 Gross National Income (GNI) per capita. Because of the small number of studies coming from upper-middle and high income countries (given the focus of the review on developing and transitional countries), data from these two economic regions were analysed as one group.

Studies were divided into four categories defined by the ownership of the health-care facilities where they were conducted. The public sector category included studies of medicines use in health-care facilities owned by the government. Studies involving health-care facilities owned by missions and other charitable or faith-based organizations were classified in the private, not-for-profit category. The private for-profit category contains studies involving for-profit health-care facilities. Studies that did not belong to any of the above categories, either because they evaluated self-medication (patients' interviews in health-care facilities), included several types of health-care facilities, or did not include a health-care facility description, were classified as 'not applicable, self-medication'. More than half the studies (66%) focused on the public health sector, 14% on the private for-profit sector and 1.5% on the non-profit sector, which includes missions and other charitable organizations. The remaining studies were classified as 'unspecified' (unknown) or 'not applicable/self-medication'.

Studies were also grouped according to the type of prescriber involved. Paramedical health workers' and/or nurses' prescribing was measured in 45% of studies, while 31% focused on doctors. In 11% of studies, medicines were prescribed by lay persons. Pharmacists and pharmacy assistants were the focus in 3% of the studies, while in 10% of studies either the prescriber type was not defined or a mixture of prescribers was reported.

Figure 3.1 describes the chronologic distribution of studies, by period in which data were collected.

Figure 3.1: Medicines use studies by year in which the data were collected

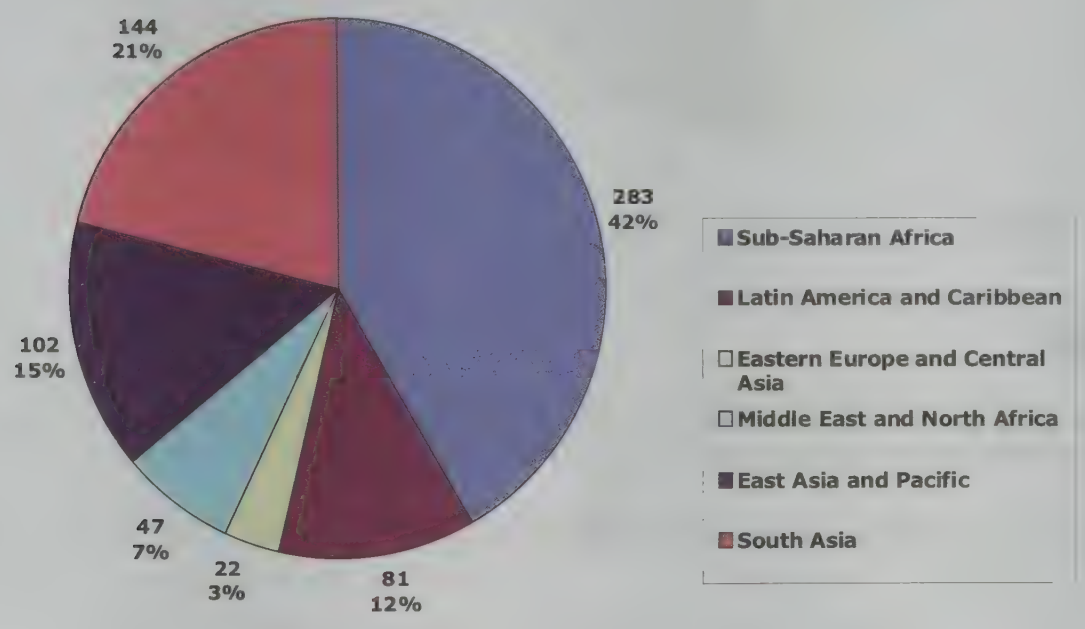


Key Points:

- The entire database consisted of 679 studies of medicines use covering 25 years of data collection up to December 2006.
- The first 10-year period from 1982 to 1991 contributed 16% of the compiled data.
- Each of the 3-year periods from 1992 to 2003 contributed about 20% of the data.

Figure 3.2 shows the number and percentage of studies by geographic origin, using the World Bank regional classification to group countries. Because of the small number of studies coming from countries in the Europe and Central Asia region and in the Middle East and North Africa region, data from these two regions will be presented as one group in the remaining graphs of the report.

Figure 3.2: Medicines use studies by World Bank region

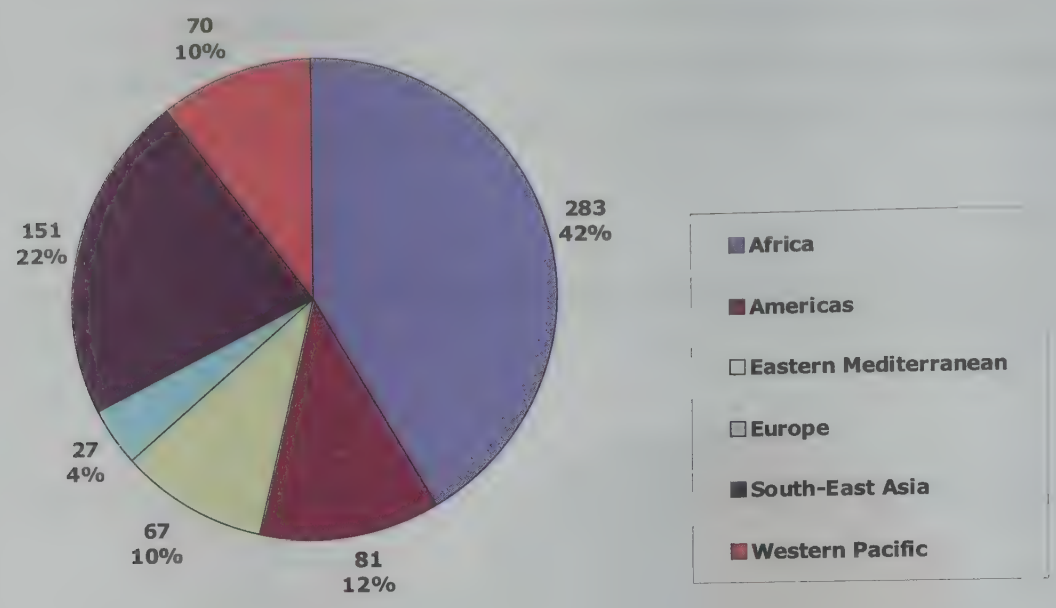


Key Points:

- The largest number of studies came from the WB Africa region, representing over 40% of the studies.
- Over a third of studies originated in the WB South Asia (21%) and East Asia/ Pacific (15%) regions.
- About one in ten studies came from the WB Latin America/Caribbean region.
- The remaining studies came from the Middle East/ North Africa and the Europe/Central Asia regions. Western Europe was not represented, as its countries were excluded by the scope of this review.

Figure 3.3 presents the number of surveys by WHO regional area. The majority of studies were undertaken in the African and South East Asian regions. Very few studies have been conducted in the European region. Several studies are included from the Eastern European region which covers central Asia and the newly independent states; Western Europe (part of the WHO EURO region) was excluded since the database focused on developing and transitional countries.

Figure 3.3: Medicines use studies by WHO region

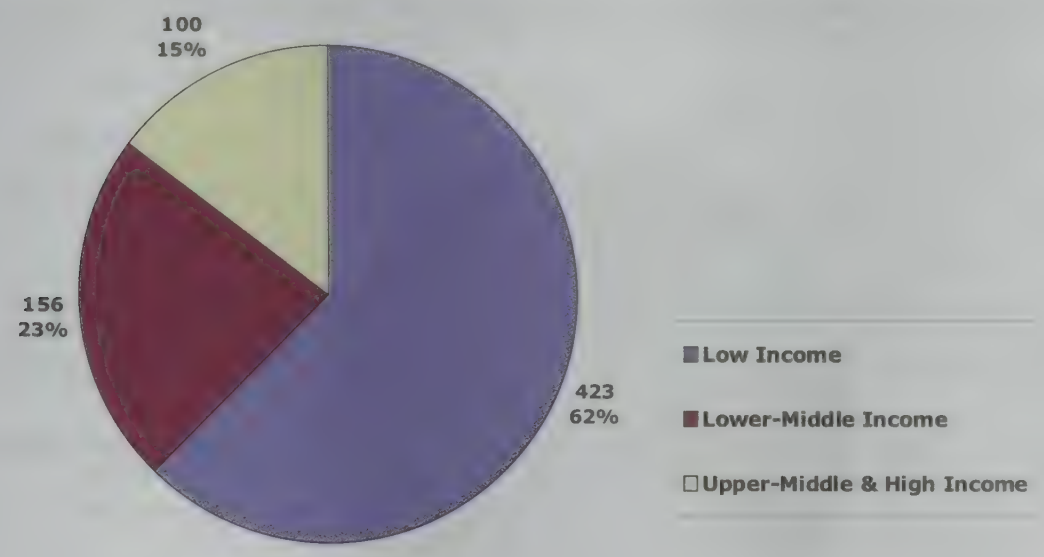


Key Points:

- The largest number of studies of medicines use came from the Africa WHO region (AFRO), representing over 40% of the studies in the database.
- A third of the studies originated from the WHO South East Asia (SEARO) and Western Pacific (WPRO) regions.
- About one in 10 studies came from the WHO Americas region (AMRO/PAHO).
- The remaining studies came from the WHO Eastern Mediterranean (EMRO) and Eastern European (part of EURO) regions.

Figure 3.4 shows the number and percentage of studies by country economic level, using World Bank data on 2006 Gross National Income (GNI) per capita to group countries. Because of the small number of studies from upper-middle and high income countries, these two economic regions are presented as one group.

Figure 3.4: Medicines use studies by World Bank country income level

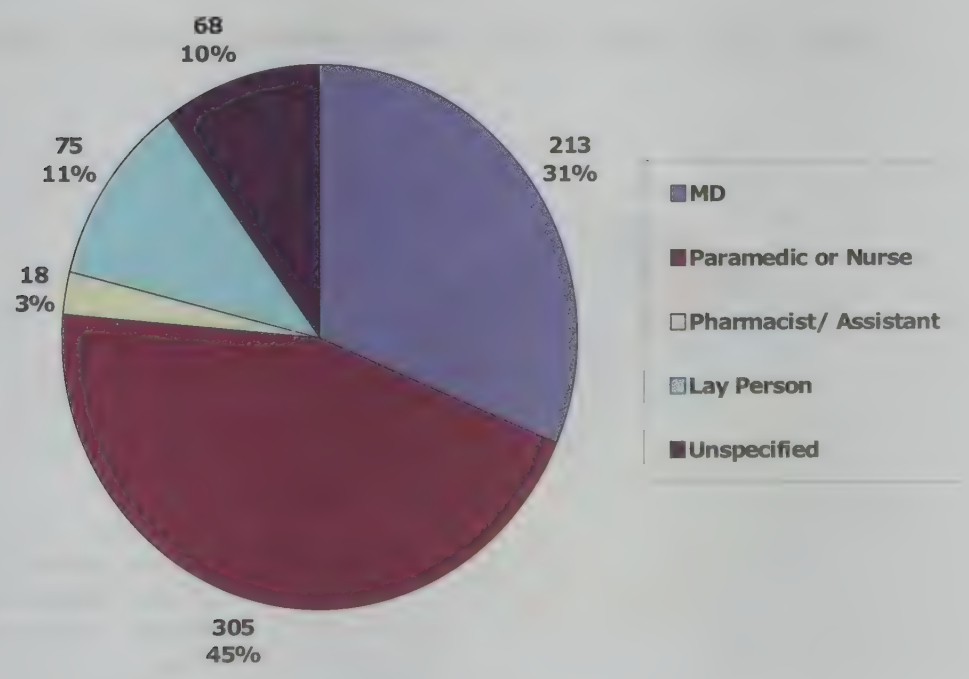


Key Points:

- Over 60% of studies of medicines use originated from low income countries.
- Almost nine in ten identified studies of medicines use were conducted in low income or lower-middle income countries
- The remaining studies originated in upper-middle and high income countries, with the largest contingent coming from Mexico, South Africa, Brazil, and Malaysia.

Figure 3.5 shows the number and percentage of studies of medicines use by prescriber type.

Figure 3.5: Medicines use studies by prescriber type

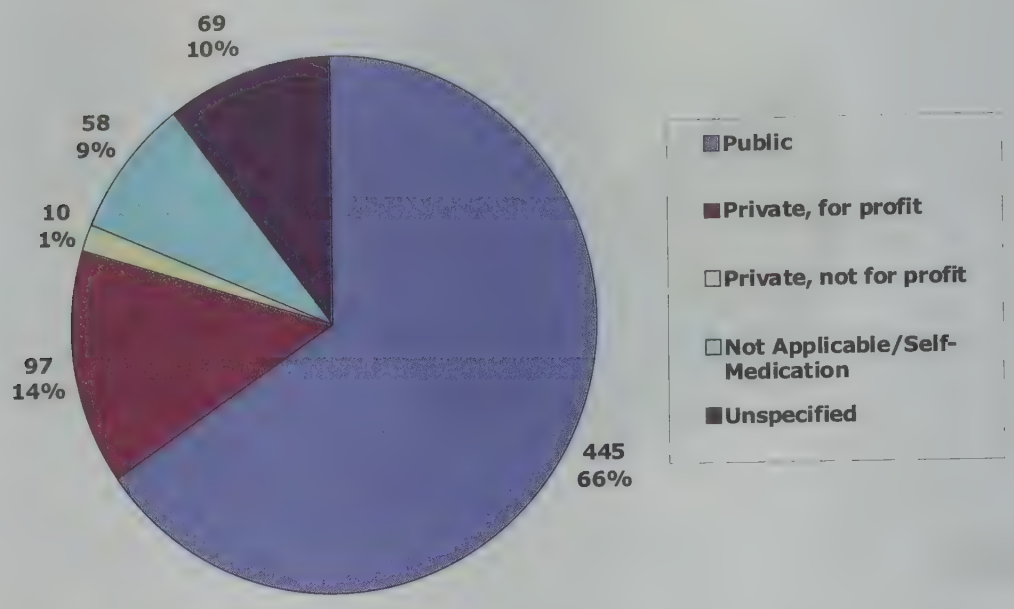


Key Points:

- A subset of 518 studies of medicines use, representing 76% of the studies, identified the prescriber to be a medical doctor, paramedical health worker, or a nurse.
- In this subset, four out of ten studies investigated prescribing of medical doctors (MDs).

Figure 3.6 presents studies of medicines use by type of ownership of the health-care facilities investigated.

Figure 3.6: Medicines use studies by health facility ownership

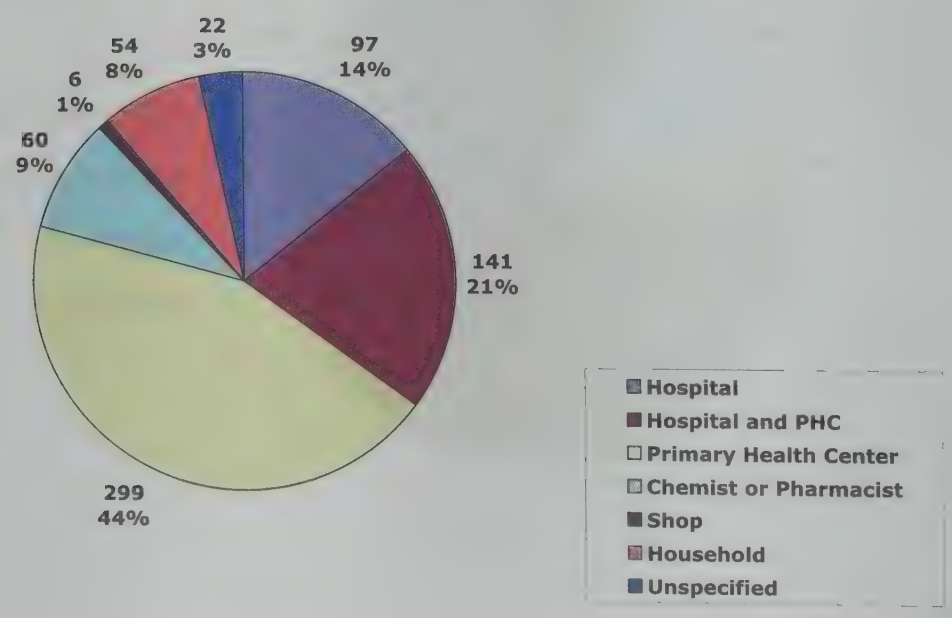


Key Points:

- The majority of studies of medicines use investigated health-care facilities from the public sector.
- About one in seven studies reported medicines use in the private for-profit sector.
- Very few studies examined the private not-for-profit sector.

Figure 3.7 shows the number and percentage of studies of medicines use within different types of health-care facility.

Figure 3.7: Medicines use studies by facility type



Key Points:

- Overall, 80% of studies in the database investigated medicines use in hospitals, primary care facilities or health centres (PHCs), with over half of these evaluating practices in primary care facilities.
- One in five studies examined use of medicines in chemists, other medicine retail outlets, or in households.

3.3 Baseline medicines use studies for specific diseases

The database contains many studies reporting general use of medicines for all ages. It also contains studies related to the treatment of children (43%), studies focusing on specific diseases (57%), mostly common childhood illnesses, such as acute diarrhoea (32%), acute respiratory tract infections (30%), and malaria (15%), or sexually transmitted diseases (4%). Many of these studies were associated with various national and international vertical control programmes to reduce childhood mortality and, more recently, to the implementation of Integrated Management of Childhood Illnesses (IMCI) which represents 8% of studies in the database.[23] Results related to the treatment of specific diseases are presented in Sections 6 to 8 of the report.

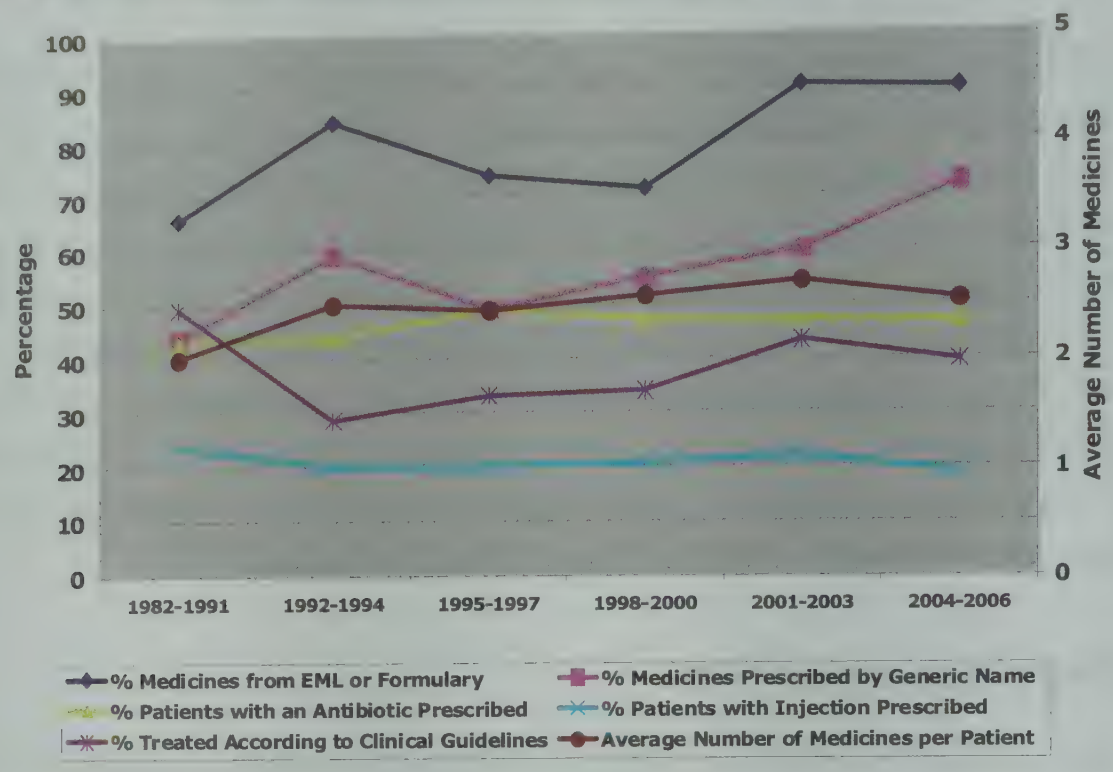
4. WHO/INRUD PRESCRIBING INDICATORS

WHO/INRUD indicators can be used to explore patterns of prescribing in primary care in developing and transitional countries. This section examines WHO/INRUD prescribing indicators extracted from studies of medicines use as described in Table 2.1, regardless of patients' age or disease. Results are presented in relation to the chronological period of data collection, geographic origin of studies, health-care facility ownership, and type of prescriber for the following indicators: percentage of medicines from EML/formulary, percentage of medicines prescribed by generic name, percentage of patients with an antibiotic prescribed, percentage of patients with an injection prescribed, percentage of patients treated according to clinical guidelines, and average number of medicines per patient.

4.1 Medicines use over time

Figure 4.1 shows results for WHO/INRUD prescribing indicators in studies of medicines use over time. Observed trends provide a meaningful indication of changes in prescribing patterns over time. However, prescribing indicators cannot differentiate prescribers' practices from patients needs, and extrapolating reasons behind observed trends is not possible because of the multiple factors influencing prescribing.

Figure 4.1: WHO/INRUD prescribing indicators, by time period



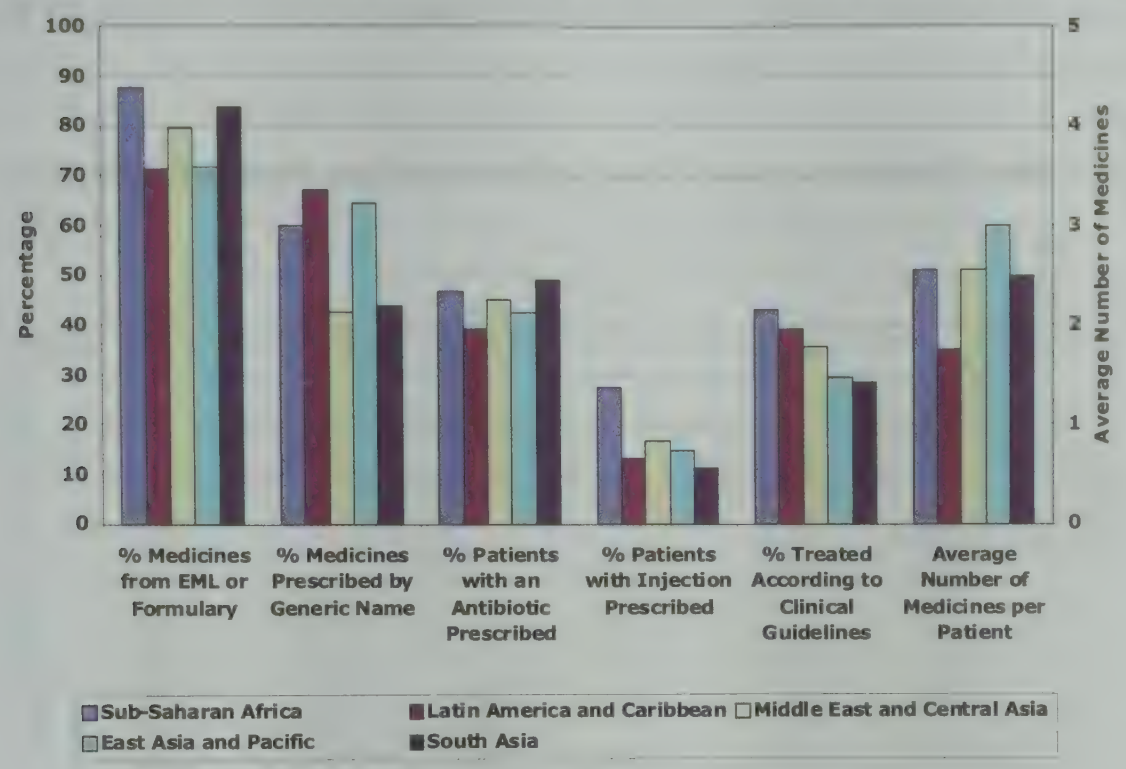
Key Points:

- Results from studies of medicines use suggest that prescribing patterns have not improved consistently overtime.
- The percentage of prescribed medicines present on an EML/formulary seems to have increased in 25 years. This encouraging trend has been progressive, and may reflect an increased availability of EML/formularies and/or better awareness of their existence.
- The percentage of medicines prescribed by generic name increased steadily to reach over 70% in the 2004-2006 period of data collection. This trend may be related to an increased availability of generics and implementation of generic prescribing and dispensing policies.
- In contrast to these positive trends, the percentage of patients treated according to clinical guidelines remained at substandard levels, below 50% at every period of data collection from 1992 on.
- The percentage of patients with an antibiotic prescribed remained stable over time at between 40% and 50%. This indicator did not differentiate between appropriate and inappropriate antibiotic prescribing.
- The percentage of patients with an injection prescribed and the average number of medicines per patient showed no apparent trends over the years.

4.2 Medicines use by region

Figure 4.2 presents overall results of the WHO/INRUD prescribing indicators in studies of medicines use by World Bank region. Because of the small number of studies from the Middle East/North Africa and Europe/Central Asia regions, these were grouped under one Middle East and Central Asia region.

Figure 4.2: WHO/INRUD prescribing indicators, by World Bank region

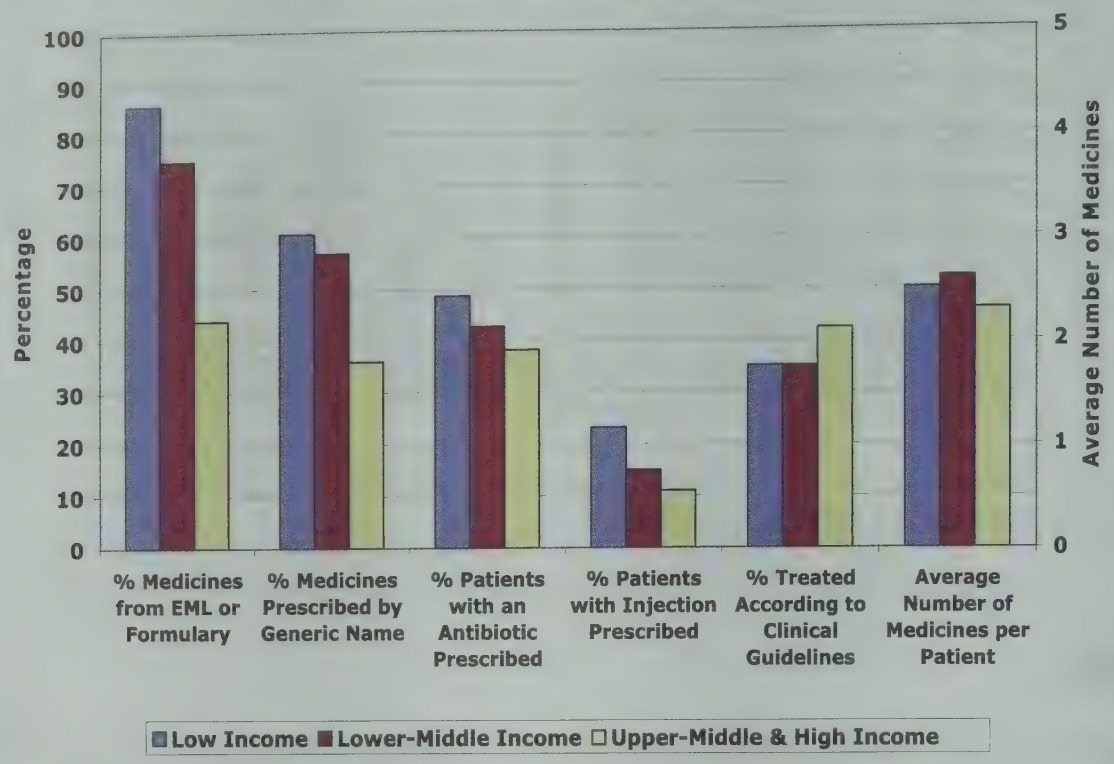


Key Points:

- Results from studies of medicines use provide a mixed picture of prescribing patterns across different geographic regions over the entire period of data collection.
- Studies from Africa pointed towards positive characteristics in this region, with the highest percentage of medicines prescribed from an EML/formulary, and the highest percentage of patients treated according to clinical guidelines. However, they also showed the highest percentage of patients with an injection prescribed.
- Studies from Latin America had the highest percentage of medicines prescribed by generic name, while studies from Middle East and Central Asia had the lowest.
- The percentage of reported patients with an antibiotic prescribed was similar across regions.
- Across regions, studies reported up to 3 medicines prescribed per patient.
- The percentage of compliance with clinical guidelines was below 50% in all regions.

Figure 4.3 presents overall results of the WHO/INRUD prescribing indicators in studies of medicines use by World Bank income level of countries where they were conducted.

Figure 4.3: WHO/INRUD prescribing indicators, by World Bank income level

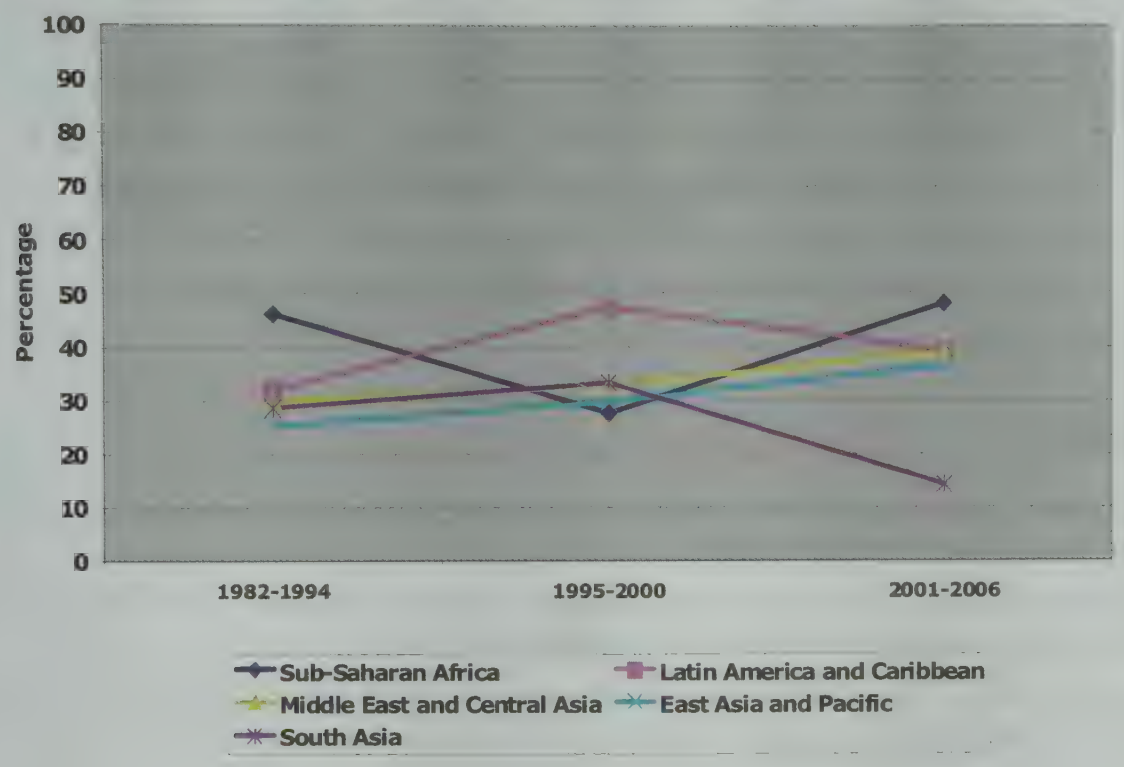


Key Points:

- Results from studies of medicines use may indicate disparities in prescribing patterns across regions of different economic level.
- Studies from low income settings suggest a higher percentage of medicines prescribed from EML/formularies and by generic name in these countries. Nevertheless, they also report the highest percentages of patients treated with an antibiotic and with an injection.
- The percentage of patients treated according to clinical guidelines was below 50% regardless of income level of the country where studies were conducted.
- The average number of medicines prescribed was between 2 and 3 across country income levels.

Figure 4.4 shows results of the percentage of patients treated according to clinical guidelines in the identified studies of medicines use, by chronological periods of data collection and by World Bank region. Adherence to clinical guidelines refers to adherence to prescribing guidelines as it relates to the choice of medicine, dosage, and duration. Chronological periods have been grouped into three to highlight overall trends.

Figure 4.4: Rates of adherence to clinical guidelines over time, by World Bank region



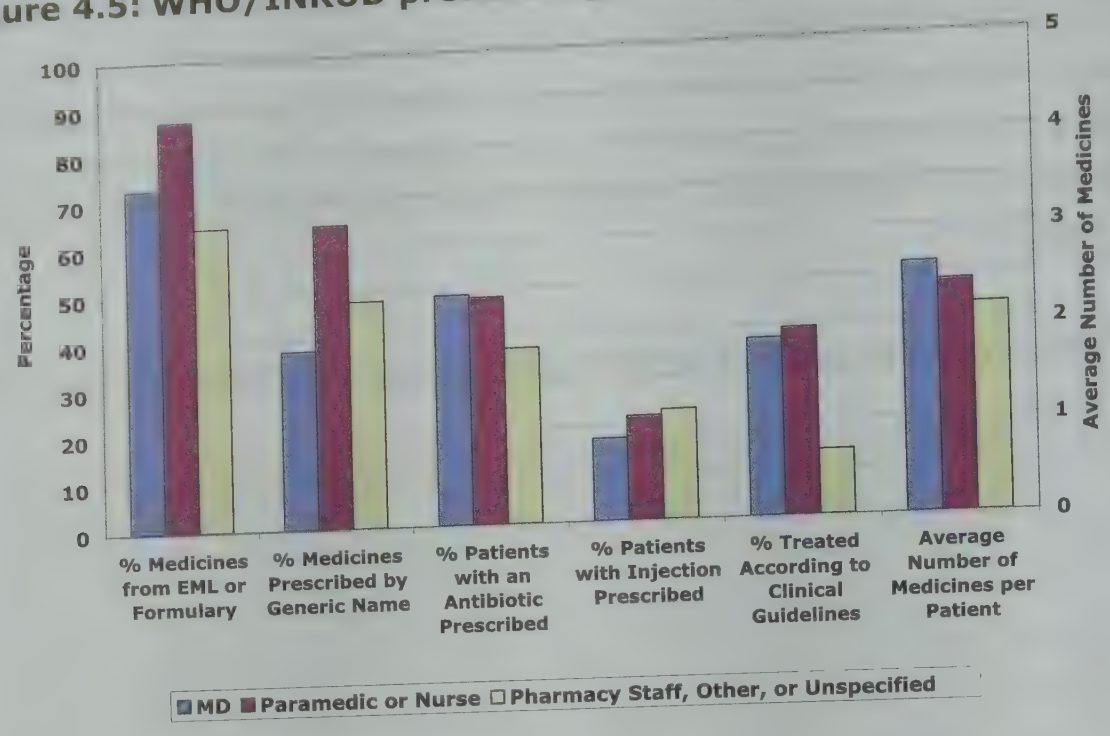
Key Points:

- Overall, results from studies of medicines use show that only half of the patients or less were prescribed medicines according to clinical guidelines during the most recent period of data collection, regardless of the geographic origin of studies.
- This percentage increased slightly in studies from Middle East & Central Asia and East Asia & Pacific, suggesting some degree of improvement in adherence to prescribing guidelines between the 1982-1994 and 2001-2006 periods in these regions. Overall compliance with guidelines remained low.
- The sample of studies between 2001 and 2006 with data on adherence to prescribing clinical guidelines may be too small in all regions but Africa to interpret results of this period with confidence.

4.3 Medicines use by type of prescriber

Figure 4.5 presents overall results of the WHO/INRUD prescribing indicators by type of prescriber, regardless of the chronological period of data collection, region, or ownership of health-care facility.

Figure 4.5: WHO/INRUD prescribing indicators by prescriber type



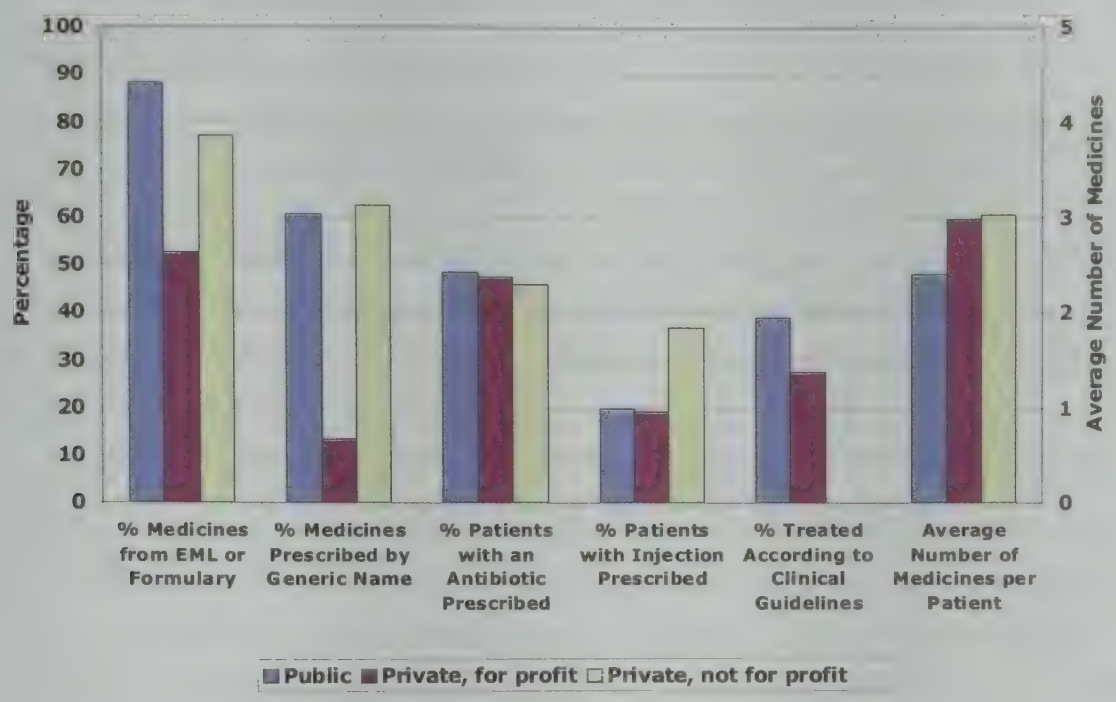
Key Points:

- Results from studies of medicines use suggest that prescribing patterns were substandard regardless of the type of prescriber.
- Paramedical health-care workers/nurses prescribed more generic medicines and more medicines from EML/formularies than medical doctors.
- Results did not uncover other important differences between the prescribing of medical doctors and that of paramedical health-care workers/nurses.

4.4 Medicines use by health-care facility ownership

Figure 4.6 presents overall results of the WHO/INRUD prescribing indicators by ownership of health-care facility, regardless of chronological period of data collection or region. A key policy issue in many countries is whether prescribing is more appropriate in the public or private sector. Since many private sector studies measure the practices of unqualified pharmacists and shop attendants (see Figure 4.5), the comparison between public and private sector practices may not be valid. Therefore the following comparison is based only on studies measuring the prescribing of physicians, nurses, or paramedics.

Figure 4.6: WHO/INRUD prescribing indicators by health facility ownership (prescribing by physicians, nurses and paramedics only)



Key Points:

- Overall, results suggest better prescribing patterns in public health-care facilities than in private for-profit facilities.
- Generics and medicines prescribed from an EML/formulary were much higher in studies in both the public and private not-for-profit sectors than in the private for-profit sector.
- The percentage of patients with an antibiotic prescribed was equivalently high in all sectors, at nearly half of all patients; about 20% of patients received an injection in the public and private for-profit sectors, but this percentage was much higher in studies from the private not-for-profit sectors.
- The percentages of patients treated according to clinical guidelines were low in both the public and private for-profit sectors, although somewhat higher in the public sector.
- Fewer medicines were prescribed on average in the public sector (2.4 per patient) than in either of the private sectors (3.0 per patient).

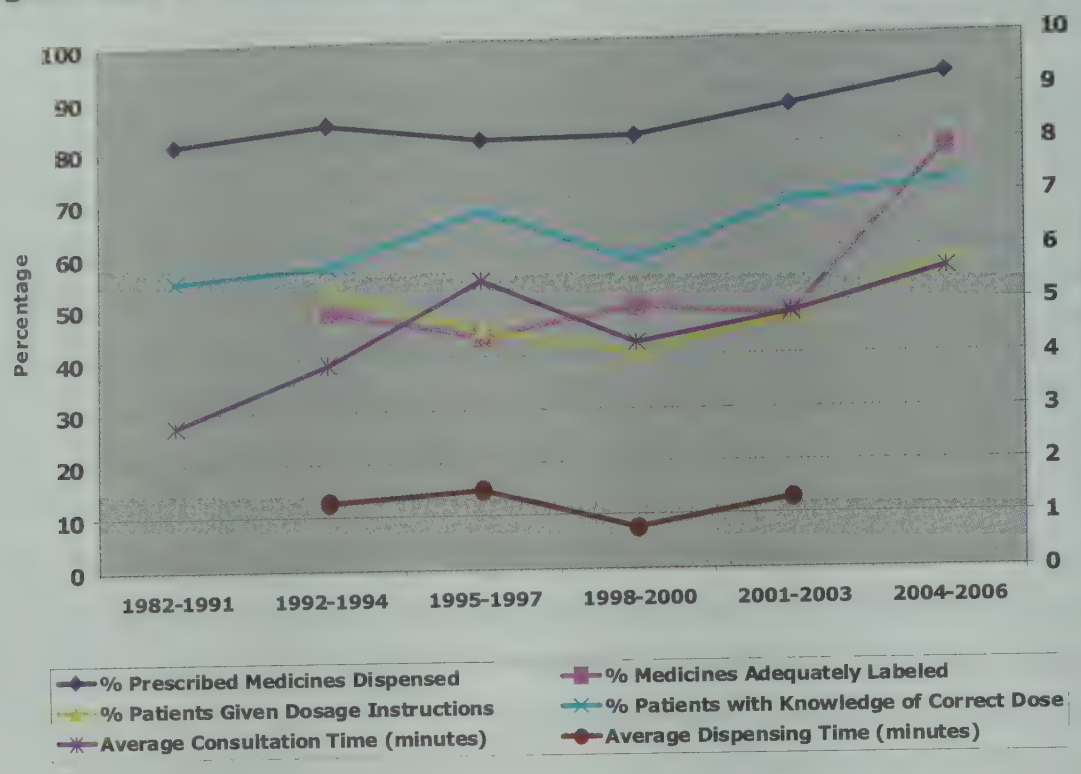
5. WHO/INRUD PATIENT CARE AND HEALTH FACILITY INDICATORS

WHO/INRUD patient care and health facility indicators can be measured to explore the quality of patient care and of health-care facilities as they relate to medicines use. This section examines WHO/INRUD indicators of patient care and health-care facility extracted from studies of medicines use as described in Table 2.1, regardless of patients' age or disease. Results of these indicators are presented in relation to the chronological period of data collection, the geographic origin of studies, health-care ownership, and type of prescriber. The following indicators of patient care were evaluated: percentage of prescribed medicines actually dispensed, percentage of medicines adequately labelled, percentage of patients given dosage instructions, percentage of patients with knowledge of correct dose, average consultation time in minutes, and average dispensing time in minutes. The following health-care facility indicators were evaluated: percentage of key medicines available in facility, availability of clinical guidelines, and availability of EML/formulary.

5.1 Patient care indicators

Figure 5.1 displays results of the WHO/INRUD patient care indicators in studies of medicines use by chronological periods of data collection, regardless of region, ownership of health-care facility, or type of prescriber.

Figure 5.1: WHO/INRUD patient care indicators, by time period

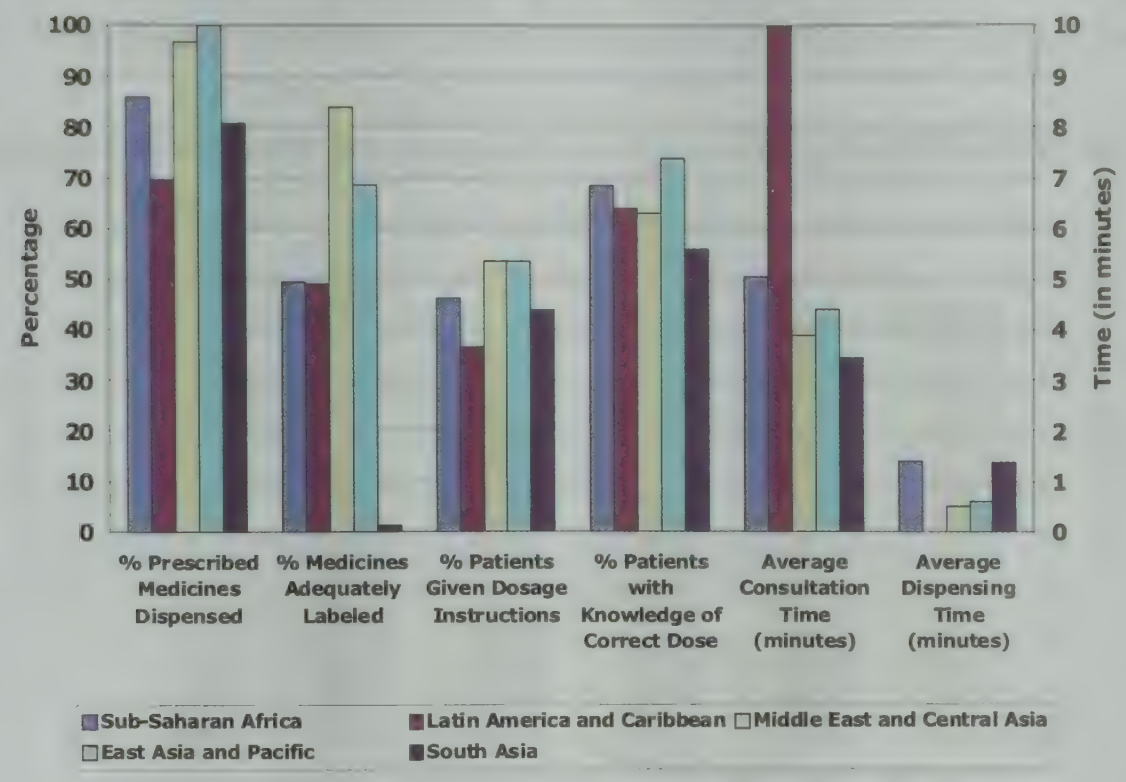


Key Points:

- Results from studies of medicines use suggest some improvement over time in many aspects of patient care related to the use of medicines. Most positive trends remain even after taking into account the fact that some of the low baseline values may be due to a very small 1982-1991 sample of studies collecting data on these indicators.
- The percentage of reported prescribed medicines that are actually dispensed increased by 10% over time to reach 92% in the most recent data collection period.
- The average consultation time showed improvement over time and the percentage of reported patients who were given dosage instructions increased slightly.
- The percentage of reported medicines adequately labelled increased noticeably over time.
- The percentage of patients with knowledge of the correct dose also showed a positive trend. However, over 25% of patients did not know which dose of medicine to take in the most recent studies.
- The average dispensing time, which includes preparation of a prescription and interaction between patient and dispenser, started low and remained at just over one minute in the most recent data collection period.

Figure 5.2 displays results of the WHO/INRUD patient care indicators in the identified studies of medicines use by region, regardless of chronological periods of data collection, ownership of health-care facility, or type of prescriber. Because of the small number of studies from the Middle East/North Africa and Europe/Central Asia regions, these were grouped into one Middle East and Central Asia region.

Figure 5.2: WHO/INRUD patient care indicators, by World Bank region

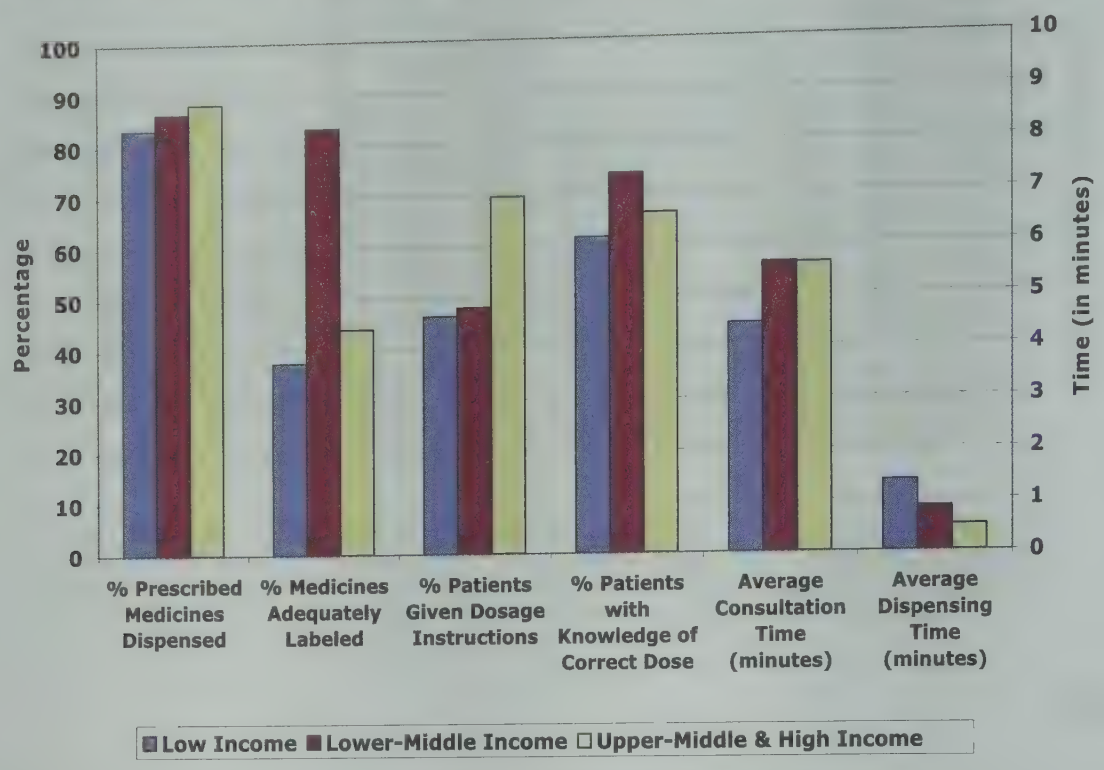


Key Points:

- Results from studies of medicines use suggest that overall trends in patient care indicators were similar across different regions of the world for the 1982-2006 period of data collection.
- Low average dispensing times, insufficient instructions to patients, and lack of patient knowledge about how to take their medicines were problems in all regions of the world.
- Studies from East Asia and Pacific reported the highest percentage of prescribed medicines actually dispensed, the highest percentage of patients given dosage instructions, and the highest percentage of patients with knowledge of the correct dose.
- Studies from Latin America reported highest average consultation time.
- Studies from Middle East and Central Asia reported the highest rate of adequate labelling while South Asia studies reported almost no medicines adequately labelled.

Figure 5.3 presents overall results of the patient care indicators in studies of medicines use by World Bank income level of countries where they were conducted.

Figure 5.3: WHO/INRUD patient care indicators, by World Bank income level

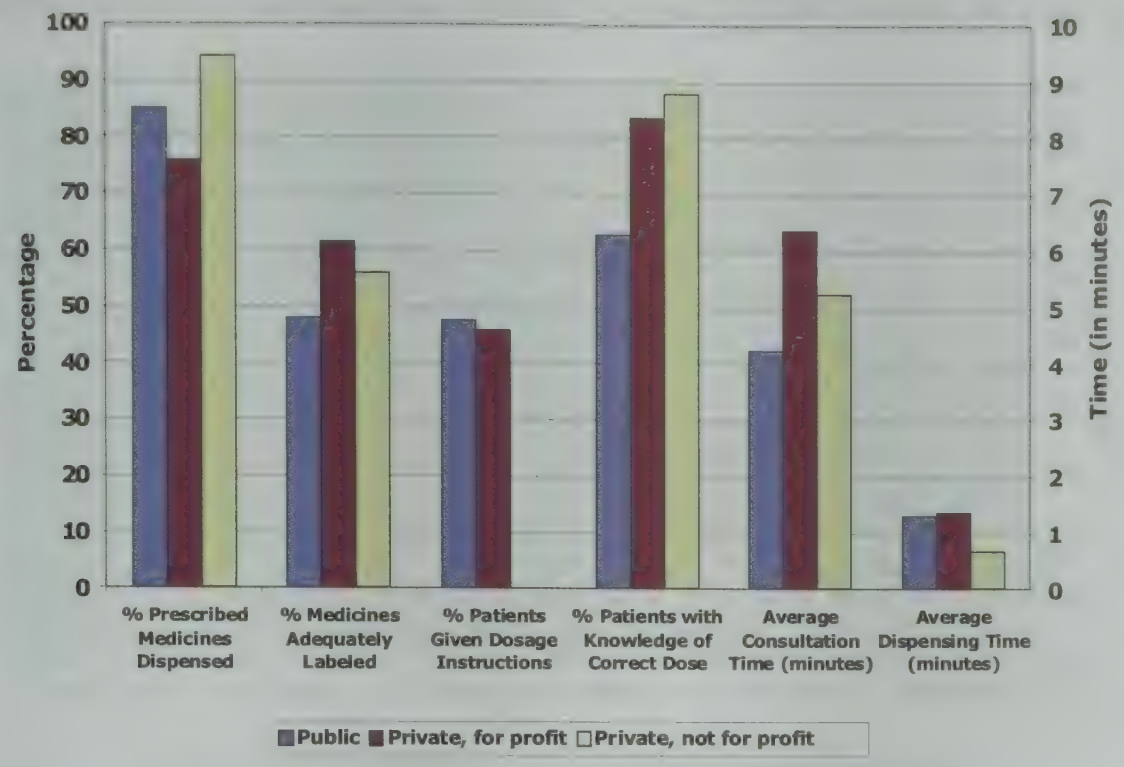


Key Points:

- Results from studies of medicines use suggest variable differences in patient care indicators across regions of different economic level.
- Studies from low income settings have the lowest percentage of medicines adequately labelled, the lowest percentage of patients given dosage instructions, the lowest percentage of patients with knowledge of correct dose, and the lowest percentage of prescribed medicines actually dispensed.
- Studies from low-middle income countries have the highest percentage of medicines adequately labelled, highest percentage of patients with knowledge of correct dose, and highest average consultation time.

Figure 5.4 displays results of the WHO/INRUD patient care indicators in the studies of medicines use by ownership of health-care facility, regardless of chronological periods of data collection, region, or type of prescribers. For these indicators, the sample size of private health-care facilities was consistently below 15, which limits the interpretation of differences between the private and public sectors. No data points were available to calculate the percentage of patients given dosage instructions in studies conducted in private not-for-profit facilities.

Figure 5.4: WHO/INRUD patient care indicators, by health facility ownership



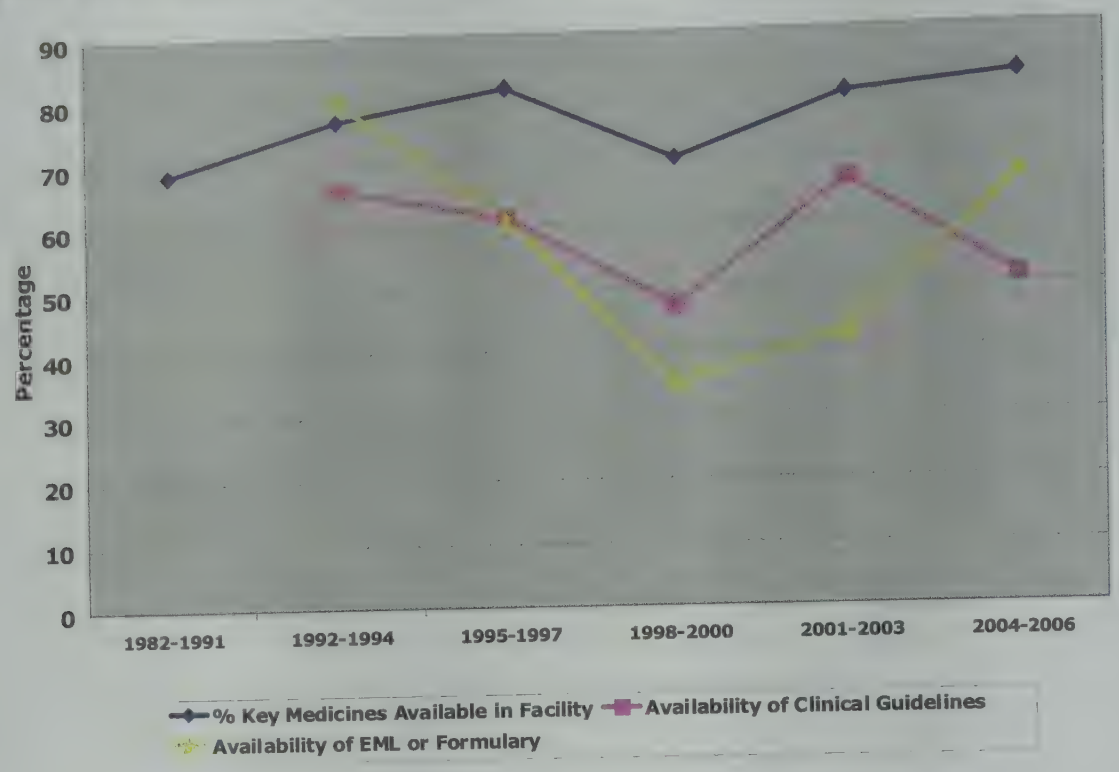
Key Points:

- Results from studies of medicines use suggest that overall patient care indicators were better in studies from private sectors. However, the small sample size of studies in both private for-profit and not-for-profit facilities with data on patient care indicators limits the reliability of this finding.
- The sample size of studies in the public sector was large, and results there suggest inadequate patient care indicators of medicines use.
- In studies of public health-care facilities, only half of the patients received dosage instructions, and more than a third of patients did not know which dose of prescribed medicine to take.
- Average consultation time in public health-care facility studies was only four minutes and average dispensing time was just over one minute.

5.2 Health-care facility indicators

Figure 5.5 displays results of the WHO/INRUD patient care indicators in the studies of medicines use by chronological periods of data collection, regardless of region or ownership of health-care facility.

Figure 5.5: WHO/INRUD health facility indicators, by time period

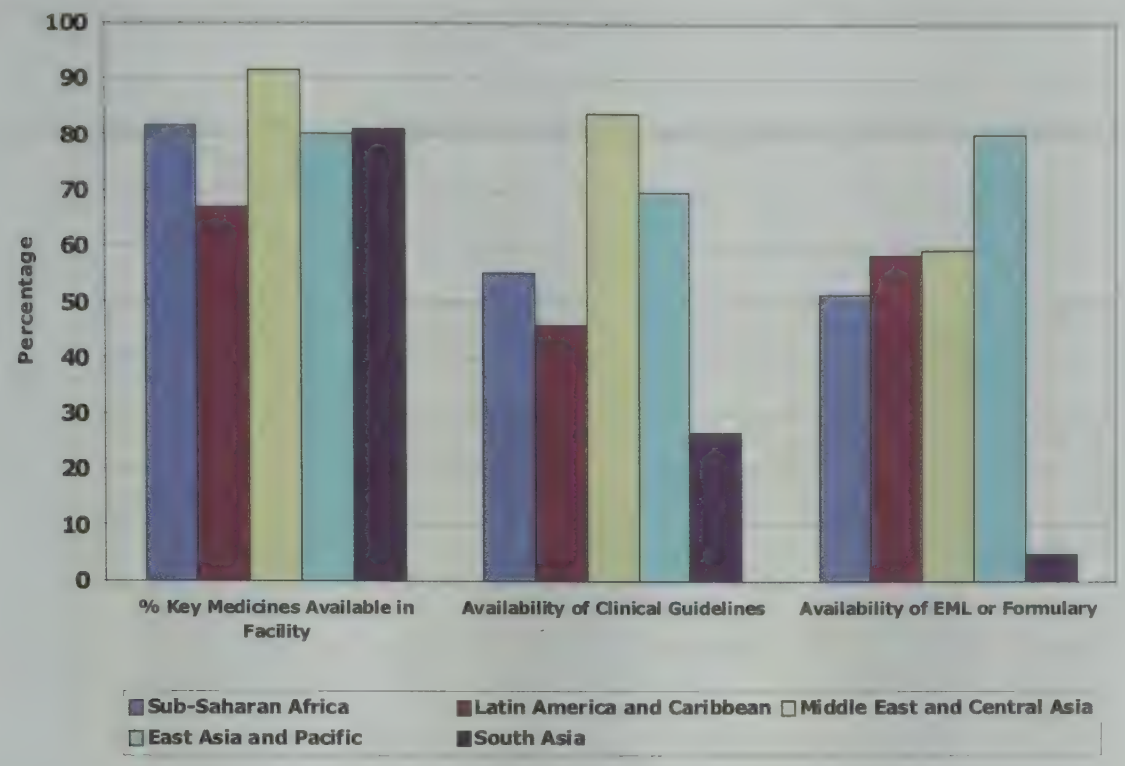


Key Points:

- Results from studies of medicines use suggest a lack of improvement in key health-care facility indicators over time.
- Reported availability of an EML or formulary to prescribers was highly variable across the time periods, ranging from about 40% to about 80% without a consistent pattern.
- Availability of clinical guidelines to prescribers did not seem to improve over time. In 2004-2006, only half of health-care facilities were reported to have clinical guidelines available during indicator surveys.
- The percentage of key medicines available in health-care facilities fluctuated between 70% and 80%. Overall, about two out of ten key medicines were not available in the health-care facilities investigated.

Figure 5.6 displays results of WHO/INRUD health-care facility indicators in the studies of medicines use by World Bank region, regardless of chronological periods of data collection or ownership of health-care facility. Because of the small number of studies from the Middle East/North Africa and Europe/Central Asia regions, these were grouped into one Middle East and Central Asia region.

Figure 5.6: WHO/INRUD health facility indicators, by World Bank region

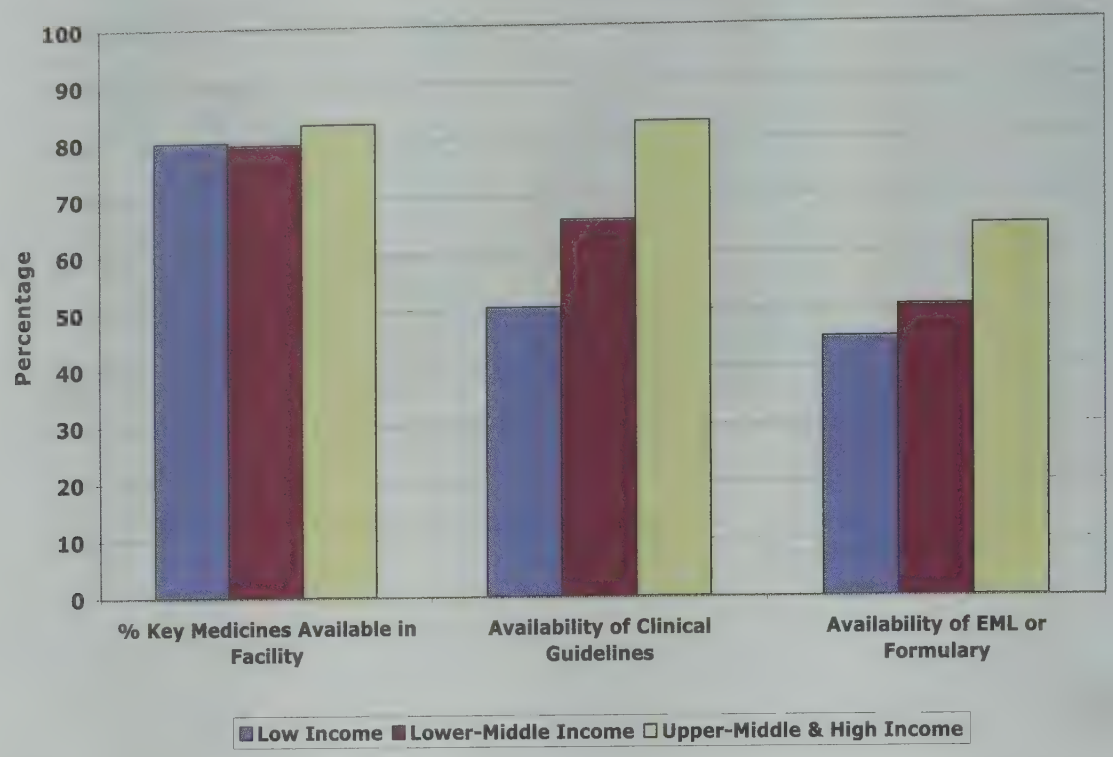


Key Points:

- Results from studies of medicines use suggest that overall trends in patient care and health-care facility indicators varied across different regions for the 1982-2006 period of data collection.
- Studies from South Asia suggest that clinical guidelines and EML/formularies were rarely accessible to prescribers in this region; however, the small sample size may limit the significance of this finding.
- In studies conducted in other regions of the world, the availability of clinical guidelines and EML/formularies was higher. Still clinical guidelines were not accessible to prescribers in half of the health-care facilities in studies from Africa and Latin America.
- The percentage of key medicines available in health-care facilities was lowest in studies from Latin America where three out of ten key medicines were not available in health-care facilities.

Figure 5.7 presents overall results of the health-care facility indicators in studies of medicines use by World Bank income level of countries where they were conducted.

Figure 5.7: WHO/INRUD health facility indicators, by World Bank income level

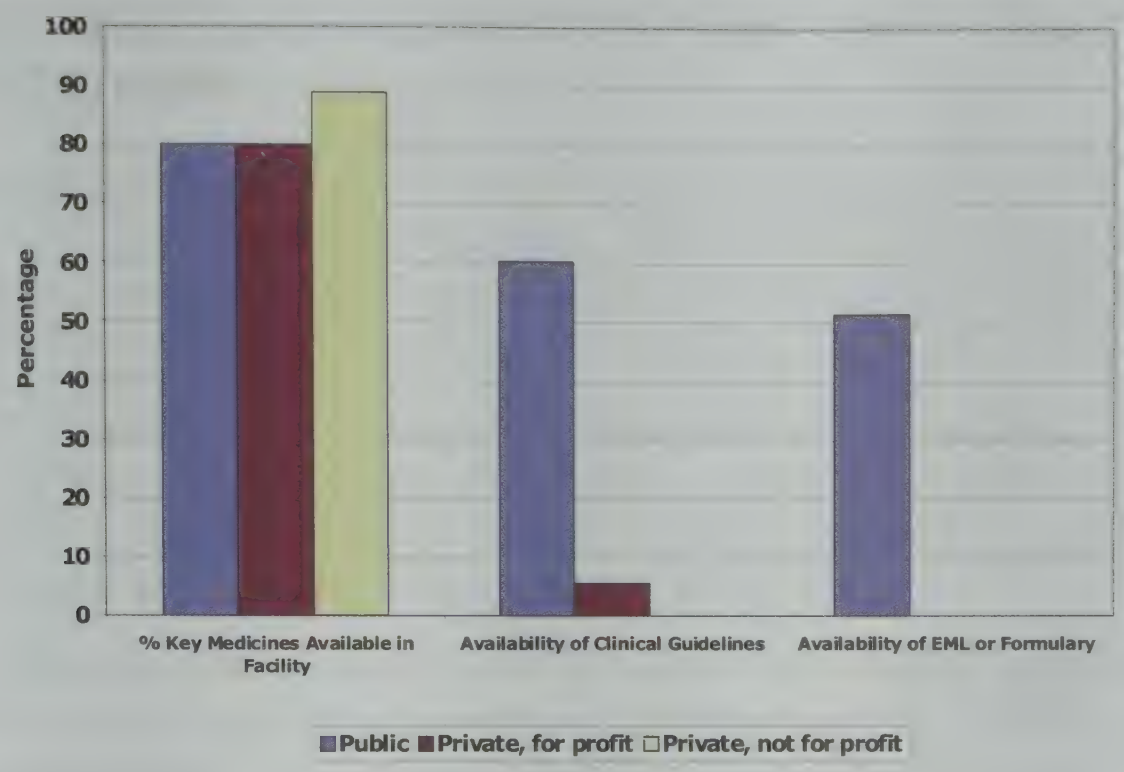


Key Points:

- Results from studies of medicines use suggest differences in availability of clinical guidelines across regions of different economic level.
- Studies from low income settings have the lowest percentages of clinical guidelines and EML/formularies available to prescribers. These percentages increased with country income level.
- The percentage of key medicines available in the health-care facility seemed similar across regions of different economic level.

Figure 5.8 displays results of WHO/INRUD health-care facility indicators in the studies of medicines use by ownership of health-care facility, regardless of chronological periods of data collection or region. Too few data points were available to calculate two of the three indicators in the private not-for-profit sector and one indicator in the private for-profit sector.

Figure 5.8: WHO/INRUD health facility indicators, by facility ownership



Key Points:

- Two out of ten key medicines were not available in public and private for-profit health-care facilities. The percentage of key medicines available in private not-for-profit health-care facilities was slightly higher.
- In about 40% of public health-care facilities, prescribers did not have access to clinical guidelines. However, the situation appeared to be much worse in the private for-profit sector.
- In half of public health-care facilities, EML/formularies were not available to prescribers.

6. TREATMENT OF ACUTE RESPIRATORY TRACT INFECTIONS

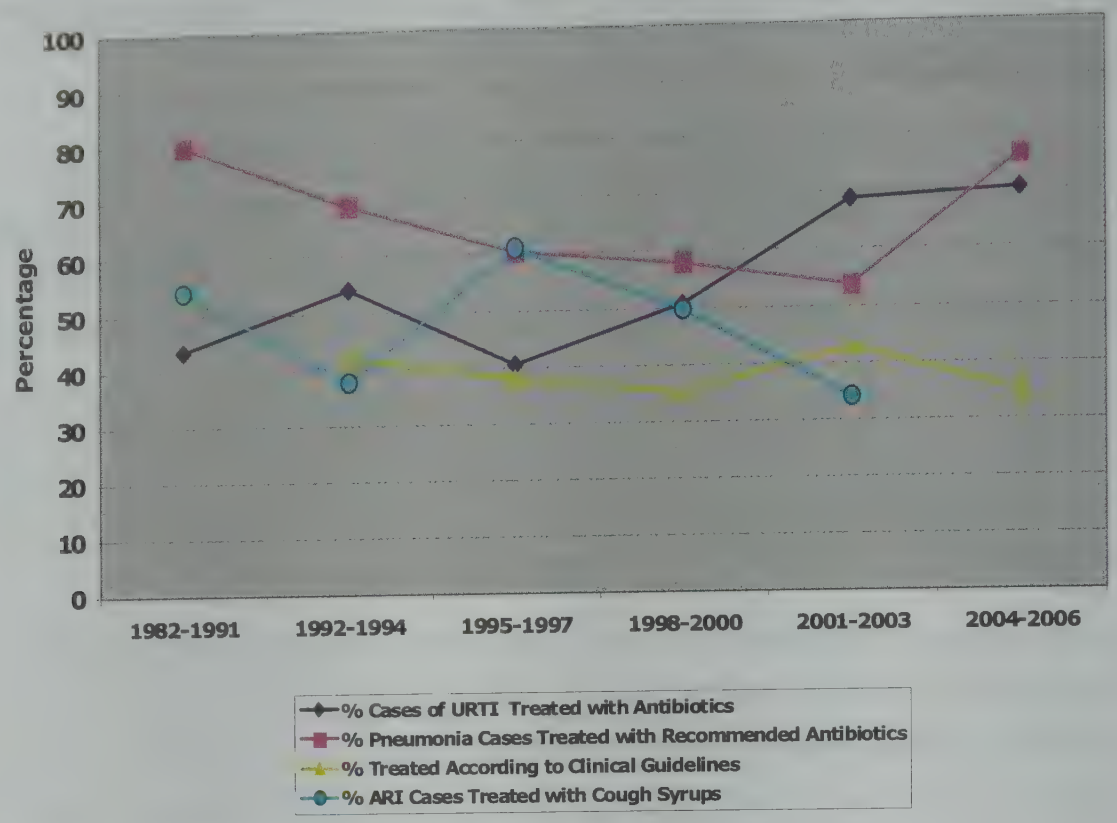
This section focuses on results about treatment of acute respiratory tract infections (ARI) from studies conducted between 1982 and 2006. ARI prescribing indicators were extracted from this subgroup of studies and are presented below to show patterns of ARI treatment over time. The following ARI indicators were evaluated:

- Percentage of cases of upper respiratory tract infections (URTI) treated with antibiotics. URTI was defined as any type of URTI that authors of the studies considered not needing antibiotics. 'Common cold' and 'sore throat' cases were considered viral URTI, i.e. not needing antibiotics.
- Percentage of pneumonia cases treated with appropriate antibiotics. Pneumonia was defined as any type of lower respiratory tract infection that authors considered needing antibiotics. The assessment by study authors was used to qualify antibiotic use as 'appropriate' or 'inappropriate'. This indicator was judged on the basis of whether an antibiotic was indicated and if so, whether the correct one was given. It did not include judgment about dosage or duration.
- Percentage of patients treated according to clinical guidelines. Clinical guidelines specifically related to treatment of all types of ARI. This indicator included judgment about whether the correct treatment was given including dosage and duration.
- Percentage of ARI cases treated with cough syrups. Cough syrups were defined as non-antibiotic cough suppressants, expectorants, demulcent cough preparations, decongestants, and medicines described by authors of studies as relieving symptoms of cough and cold.

6.1 Patterns in treatment of ARI over time

Figure 6.1 presents ARI prescribing indicators for patients of all ages over the chronological periods of data collection.

Figure 6.1: ARI prescribing indicators over time, including all studies of medicines use in ARI

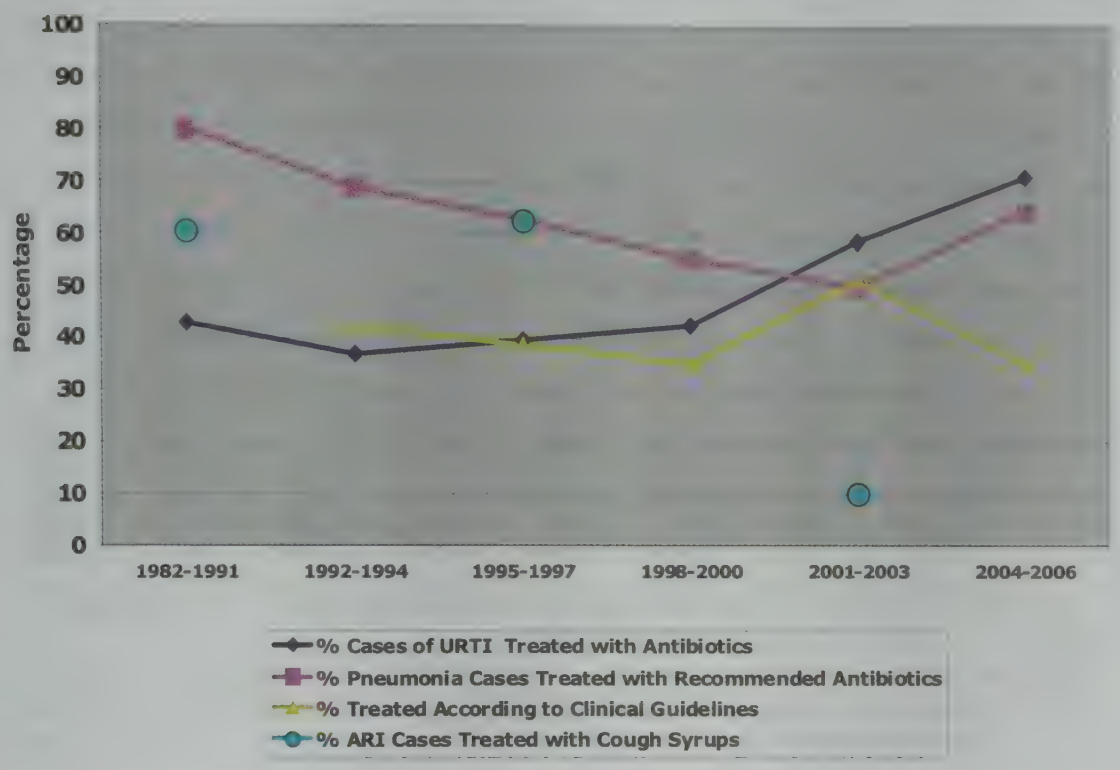


Key Points:

- Results from studies reporting medicines use in ARI suggest that ARI prescribing patterns may have deteriorated over time.
- The percentage of reported viral URTI treated with antibiotics increased over time to 71% during the 2004-2006 period.
- Over 20% of reported pneumonia cases were not treated with appropriate antibiotics during that period.
- Reported compliance with ARI standard treatment guidelines appeared to decrease overtime. During the most recent period of data collection, the percentage of reported patients treated according to ARI clinical guidelines was below 40%.
- There may have been a decrease in the use of cough syrups over time, although small sample sizes may limit the significance of this finding.

A large majority of the studies of medicines use during ARI concentrated on children under 5 years old. **Figure 6.2** presents ARI prescribing indicators over time in the subset of studies focusing on children less than 5 years old with ARI.

Figure 6.2: ARI treatment indicators over time, including only studies of medicines use in children < 5 years with ARI



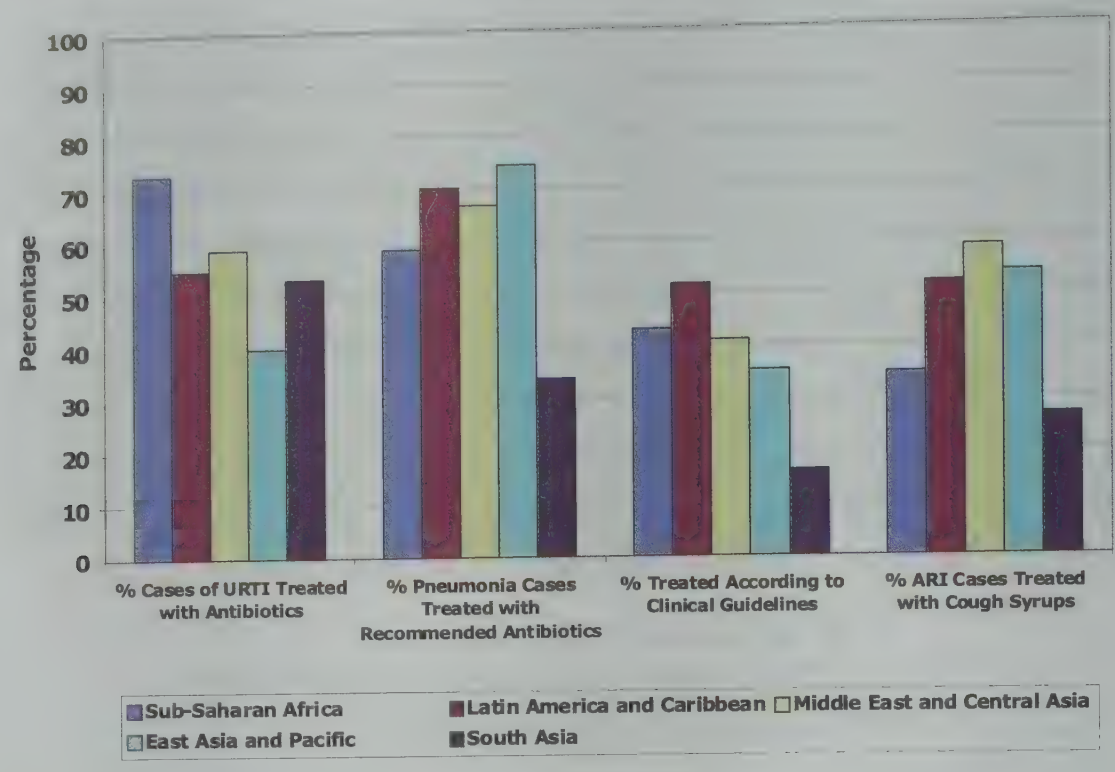
Key Points:

- Results from studies reporting medicines use suggest that treatment of ARI in children less than 5 years old did not improve over 25 years of data collection.
- The percentage of children under 5 years old with reported viral URTI who were treated with antibiotics almost doubled over 25 years to reach over 70% in 2004-2006.
- During 2004-2006, over 30% of children less than 5 years old with reported pneumonia were not treated with appropriate antibiotics.
- The percentage of children under 5 years old with ARI who were treated according to clinical guidelines did not improve overtime, and was below 40% during the 2004-2006 period of data collection.
- The small sample size of studies with data on cough syrup use may explain the observed fluctuations in percentage of ARI cases treated with cough syrups.

6.2 Patterns in treatment of ARI by region, facility ownership, and prescriber type

Figure 6.3 presents overall results of ARI prescribing indicators averaged by World Bank region. Studies were classified according to where they were conducted into categories of World Bank regions. To ensure a reasonable sample size in each group, studies from the Middle East, North Africa, Europe and Central Asia region were grouped into one Middle East and Central Asia region.

Figure 6.3: ARI treatment indicators including all studies of medicines use in ARI, by World Bank region

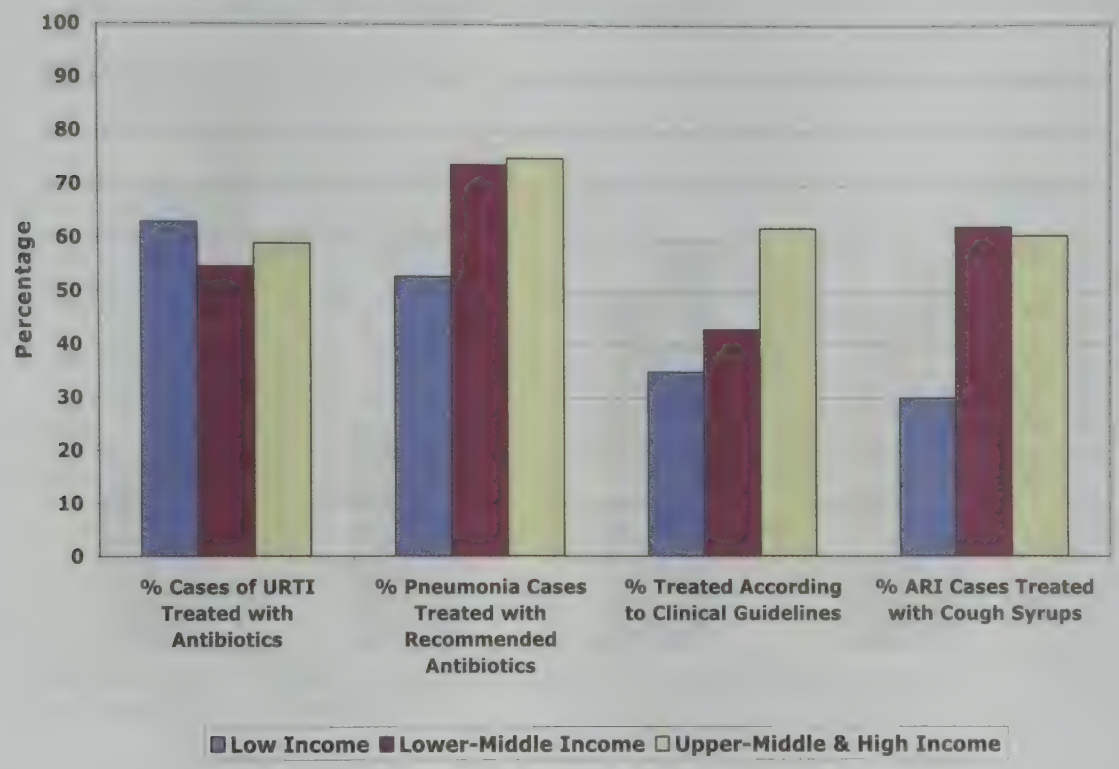


Key Points:

- Results from studies of medicines use suggest inadequate ARI prescribing patterns in every geographic region of the world.
- Everywhere, a large percentage of viral URTI study cases were treated with antibiotics, over 70% in Africa.
- In every region at least 25% of reported pneumonia cases were treated with inappropriate antibiotics.
- The percentage of ARI cases treated according to clinical guidelines was reported below 50% in studies from all regions, except from Latin America.
- Results suggest that the use of cough syrups was more prevalent in the Middle East and Central Asia region.

Figure 6.4 presents overall results of ARI prescribing indicators averaged by World Bank income level of countries where the studies were conducted.

Figure 6.4: ARI treatment indicators including all studies of medicines use in ARI, by World Bank income level

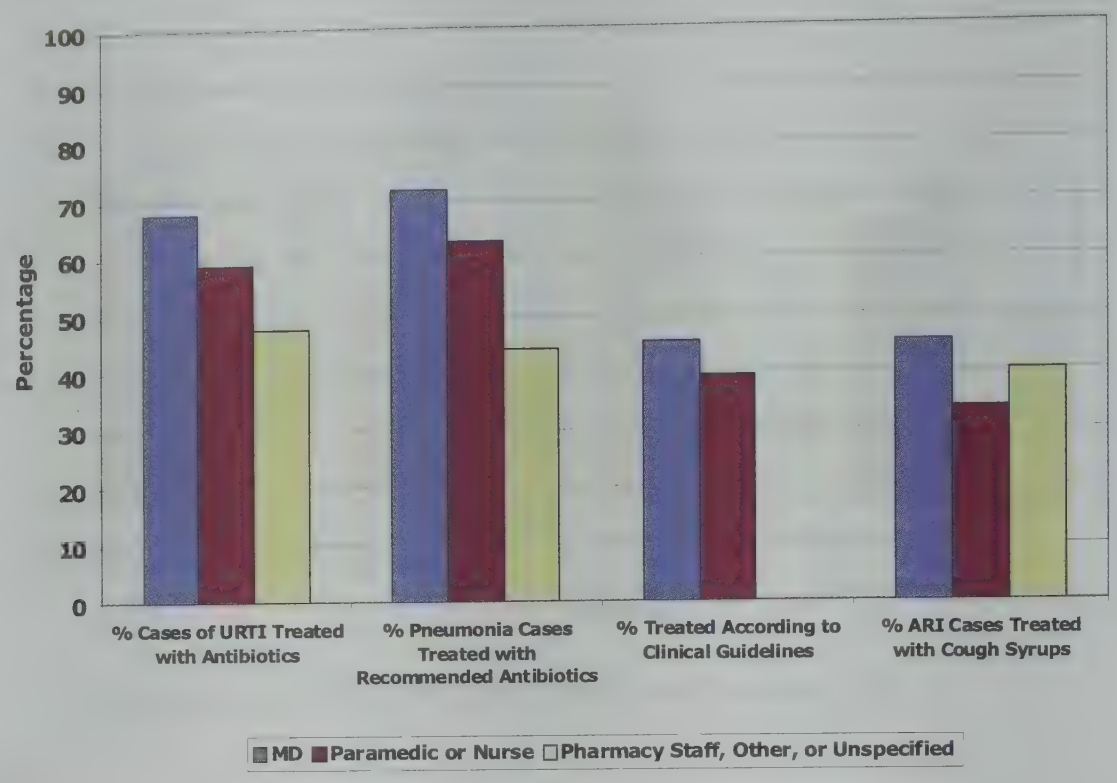


Key Points:

- Results from studies of medicines use suggest similarities and differences in prescribing patterns for ARI across income regions.
- Everywhere, a large percentage of viral URTI study cases were treated with antibiotics.
- Studies from low income countries had the lowest percentage of pneumonia cases treated with recommended antibiotics, and the lowest percentage of patients treated according to clinical guidelines.
- The percentage of ARI cases treated with cough syrups was lowest in low income countries.

Figure 6.5 presents overall results of ARI treatment indicators by type of prescriber.

Figure 6.5: ARI treatment indicators including all studies of medicines use in ARI, by type of prescriber

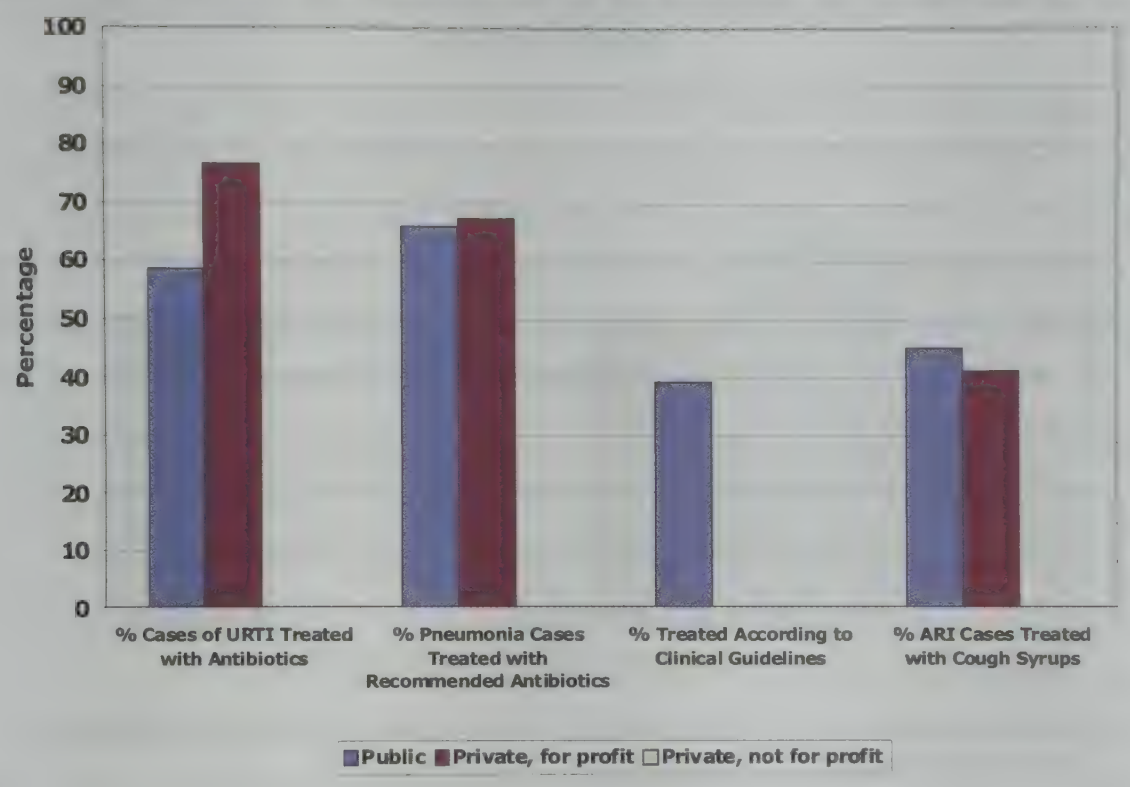


Key Points:

- Results from studies of medicines use in ARI suggest unsatisfactory prescribing patterns by all cadres of health worker.
- Medical doctors prescribed antibiotics in reported cases of viral URTI more often than paramedical health workers/nurses.
- Almost 30% of reported cases of pneumonia treated by medical doctors were not prescribed appropriate antibiotics. This percentage was higher for paramedical health workers/nurses (close to 40%) and highest for the third category, which included pharmacy staff, lay persons, or unspecified prescribers.
- Only about 40% of prescribers were reported to treat ARI according to clinical guidelines, with medical doctors and paramedical health workers/nurses having similarly poor prescribing practices.

Figure 6.6 presents overall results of ARI treatment indicators averaged by ownership of health-care facility. No data were available for two of the four ARI treatment indicators in studies conducted in the private not-for-profit sector and there were fewer than four studies reporting the other two indicators, thus these results are not displayed in the figure. To enhance comparability between sectors, the figure includes data only from studies assessing prescribing by physicians, nurses, or paramedics.

Figure 6.6: ARI treatment indicators including all studies of medicines use in ARI, by health-care facility ownership (prescribing by physicians, nurses and paramedics only)

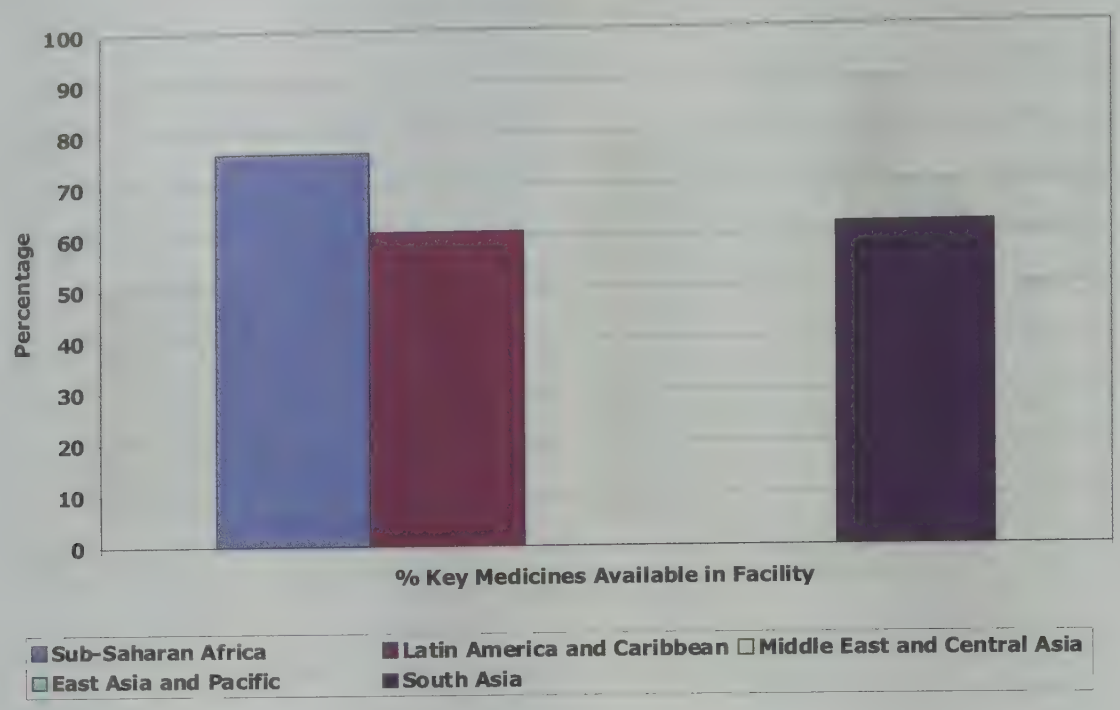


Key Points:

- Overall quality of care for ARI was poor in both the public and private sectors.
- The percentage of cases of viral URTI treated with antibiotics was substantially higher in private for-profit facilities than in public facilities.
- Only about two-thirds of reported pneumonia cases treated in both public health-care and private for-profit facilities received appropriate antibiotics.
- The percentage of ARI patients treated according to clinical guidelines was about 40% in public health-care facilities; there were too few studies in the private sectors to evaluate this indicator.
- Over 40% of cases in both the public and private for-profit sectors were treated with cough syrups, which are unnecessary for proper clinical management.

Figure 6.7 focuses on the availability of key medicines in studies of medicines use in ARI by World Bank region. The Middle East and Central Asia region is not shown on the graph because of insufficient data in this region for that indicator.

Figure 6.7: Availability of key medicines in studies of medicines use in ARI, by World Bank region



Key Points:

- The availability of key medicines to treat acute respiratory tract infection was below 80% in studies in all regions (too few studies were reported in Middle East and Central Asia and in East Asia and Pacific to summarize practice).
- Availability of medicines was particularly low in health facilities in Latin America and the Caribbean (60%) and South Asia (70%).

7. TREATMENT OF ACUTE DIARRHOEA

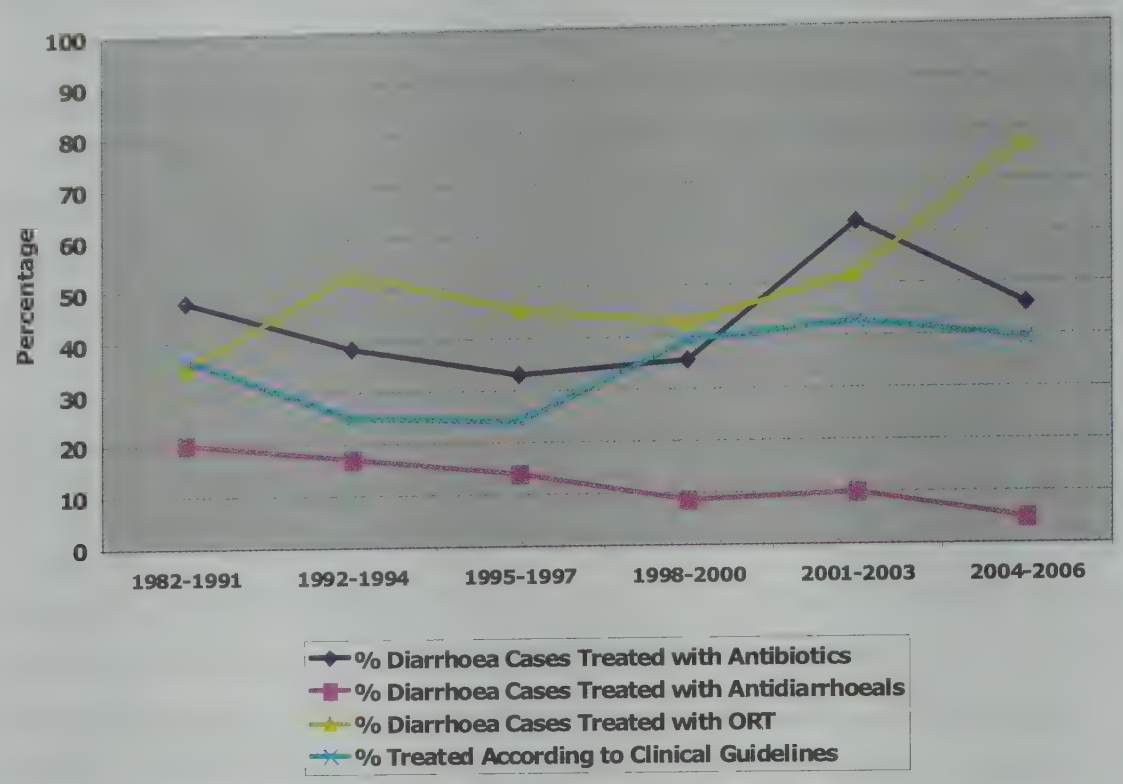
This section focuses on studies of medicines use that reported results about treatment of acute diarrhoea from data collected between 1982 and 2006. The term acute diarrhoea included all types of acute diarrhoea, including bloody diarrhoea. Acute diarrhoea prescribing indicators were extracted from this subgroup of studies and are presented below to show patterns of acute diarrhoea treatment over time. The following acute diarrhoea indicators were selected:

- Percentage of diarrhoea cases treated with antibiotics. This percentage generally, though not always, differentiated unnecessary use of antibiotics from appropriate use related to invasive bacterial diarrhoea or to other concomitant illnesses such as pneumonia or other bacterial infections. Judgment was based on the author assessment of inappropriate antibiotic for diarrhoea. Antibiotic use in dysentery was specifically excluded. Some publications did not mention the type of diarrhoea, in which case it was assumed that a majority of cases were viral diarrhoea.
- Percentage of diarrhoea cases treated with antidiarrhoeals. Antidiarrhoeals were defined as non-antibiotic medicines, including adsorbents and bulk forming medicines, anti-motility medicines, antispasmodics, and medicines described by authors of studies as relieving symptoms of diarrhoea.
- Percentage of diarrhoea cases treated with oral rehydration therapy (ORT). ORT was defined as prescription of oral rehydration salts or intravenous fluids, but did not make any judgment on dose or duration. When the only action taken was advice to increase breast feeding or home fluids, the case was excluded.
- Percentage of diarrhoea cases treated according to clinical guidelines. Clinical guidelines specifically referred to correct rehydration of acute diarrhoea cases, including dose and duration of oral and intravenous rehydration therapy.

7.1 Patterns in treatment of acute diarrhoea over time

Figure 7.1 displays acute diarrhoea treatment indicators for patients of all ages over the chronological periods of data collection.

Figure 7.1: Diarrhoea treatment indicators over time, including all studies of medicines use in acute diarrhoea

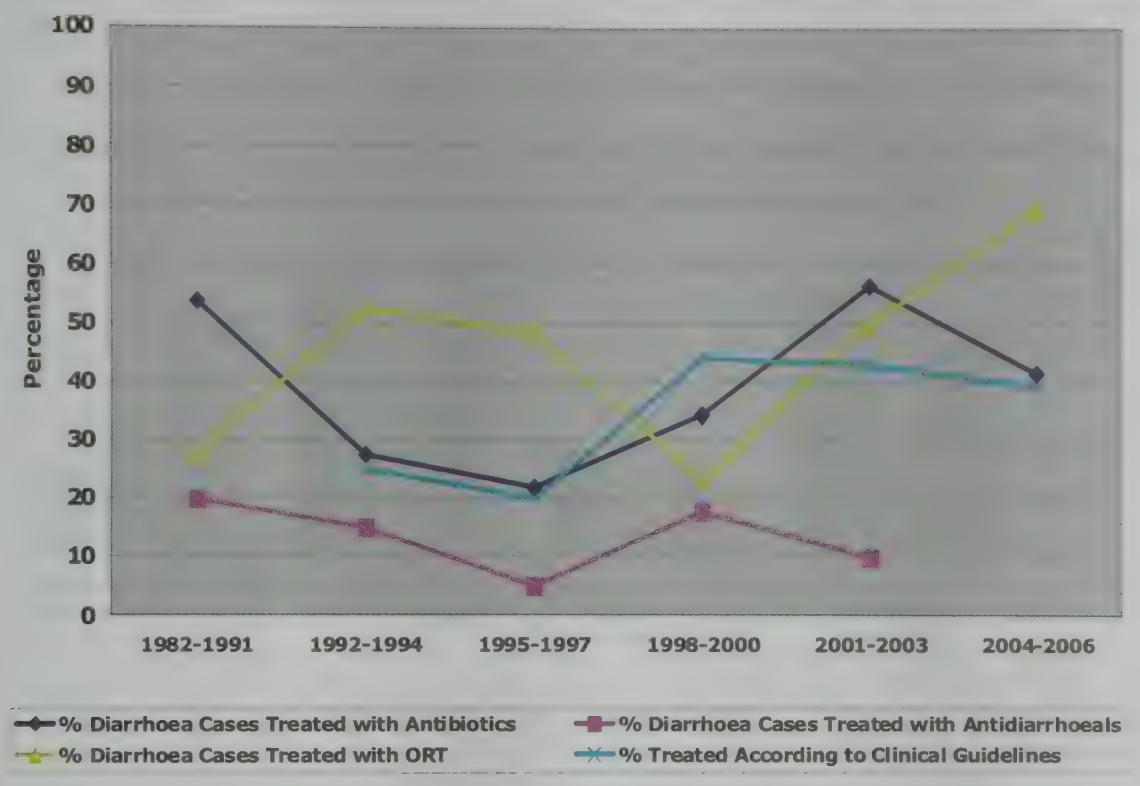


Key Points:

- Results from studies reporting medicines use suggest that patterns of acute diarrhoea prescribing have not improved consistently over time.
- Results suggest encouraging progress in ORT prescribing. The percentage of reported diarrhoea cases treated with ORT increased over time, to over 70% in 2004-2006.
- The reported use of antibiotics for acute diarrhoea fluctuated without distinct trends, while the use of antidiarrhoeals markedly decreased over time.
- Reported compliance with standard treatment guidelines for acute diarrhoea appeared to remain low over time. During the most recent period of data collection, the percentage of patients with acute diarrhoea who were treated according to clinical guidelines was still reported below 40%.

The majority of studies of medicines use in acute diarrhoea concentrated on children under 5 years old. **Figure 7.2** presents acute diarrhoea treatment indicators over time in the subset of studies focusing on children less than 5 years old diagnosed with acute diarrhoea.

Figure 7.2: Diarrhoea treatment indicators over time, including only studies of medicines use in children <5 years with acute diarrhoea



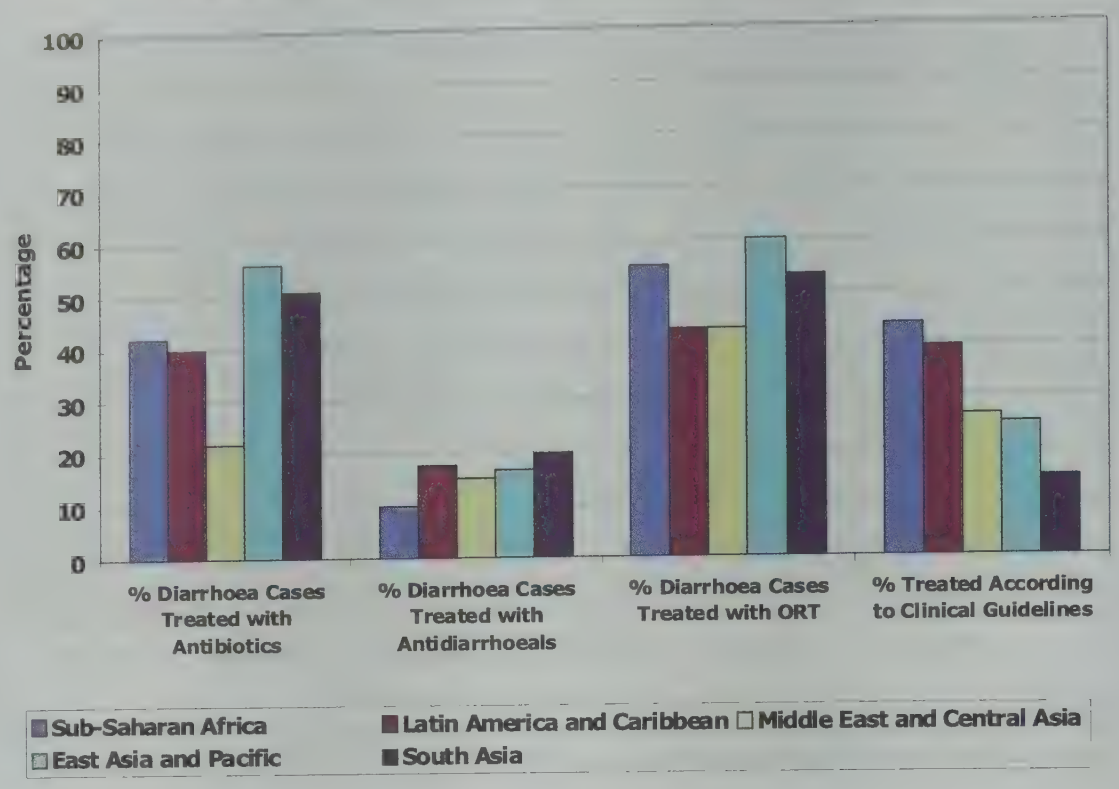
Key Points:

- Results suggest that prescribing patterns for children less than 5 years old diagnosed with acute diarrhoea have not consistently improved over time.
- The reported use of ORT for acute diarrhoea increased over time, while the use of antibiotics appeared to decrease in the mid-1990's but has risen again since then.
- Results suggest a slight positive trend with regards to antidiarrhoeal use. The percentage of reported diarrhoea cases treated with antidiarrhoeals decreased to 10% in 2004-2006, from 20% initially.
- Reported compliance with standard treatment guidelines for acute diarrhoea has improved over time although it remains low. During the most recent period of data collection, 40% of children less than 5 years old with acute diarrhoea were treated according to clinical guidelines.

7.2 Patterns in treatment of acute diarrhoea by region, facility ownership and prescriber type

Figure 7.3 presents overall results of acute diarrhoea treatment indicators averaged by geographic region. Studies were classified according to their origin into categories of World Bank regions. To ensure a reasonable sample size in each group, studies from the Middle East, North Africa, Europe and Central Asia region were grouped into one Middle East and Central Asia region.

Figure 7.3: Diarrhoea treatment indicators including all studies of medicines use for acute diarrhoea, by World Bank region

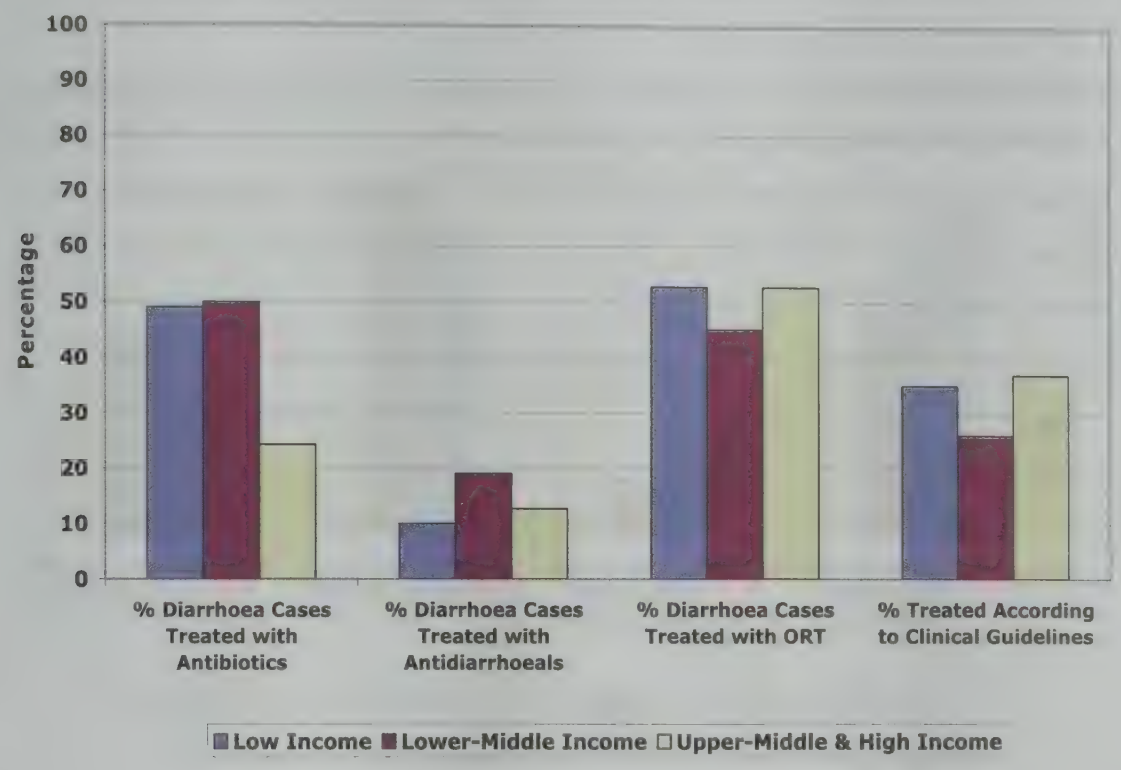


Key Points:

- Results from studies of medicines use suggest that inadequate prescribing for acute diarrhoea is present in every region of the world.
- The percentage of reported cases of acute diarrhoea treated with antibiotics varied across regions, from 22% in the Middle East and Central Asia region to over 50% in the East Asia and Pacific region.
- The use of ORT was reported low everywhere, with 60% or less of reported cases of acute diarrhoea receiving ORT.
- Across all regions, the percentage of reported acute diarrhoea cases treated according to clinical guidelines was below 50%.

Figure 7.4 presents overall results of prescribing indicators for acute diarrhoea averaged by World Bank income level of the countries in which the studies were conducted.

Figure 7.4: Diarrhoea treatment indicators including all studies of medicines use for acute diarrhoea, by World Bank income level

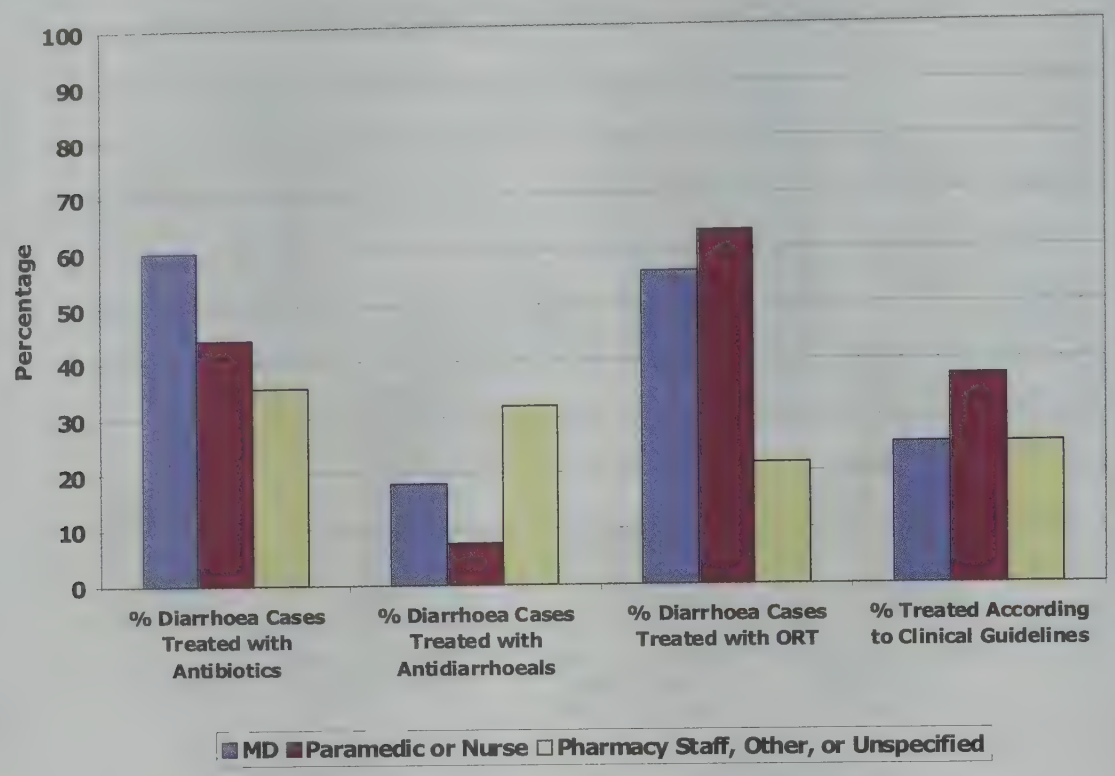


Key Points:

- Results from studies of medicines use suggest similarities in the treatment of acute diarrhoea across regions at different income level.
- Percentages of diarrhoea cases treated with antidiarrhoeals, with ORT, and percentage of patients treated according to clinical guidelines were similar in all three categories of countries.
- However, the percentage of diarrhoea cases treated with antibiotics was twice as high in studies from low and lower-middle income countries than in studies from upper-middle and high income countries.

Figure 7.5 presents overall results of acute diarrhoea treatment indicators by prescriber type.

Figure 7.5: Diarrhoea treatment indicators including all studies of medicines use for acute diarrhoea, by prescriber type

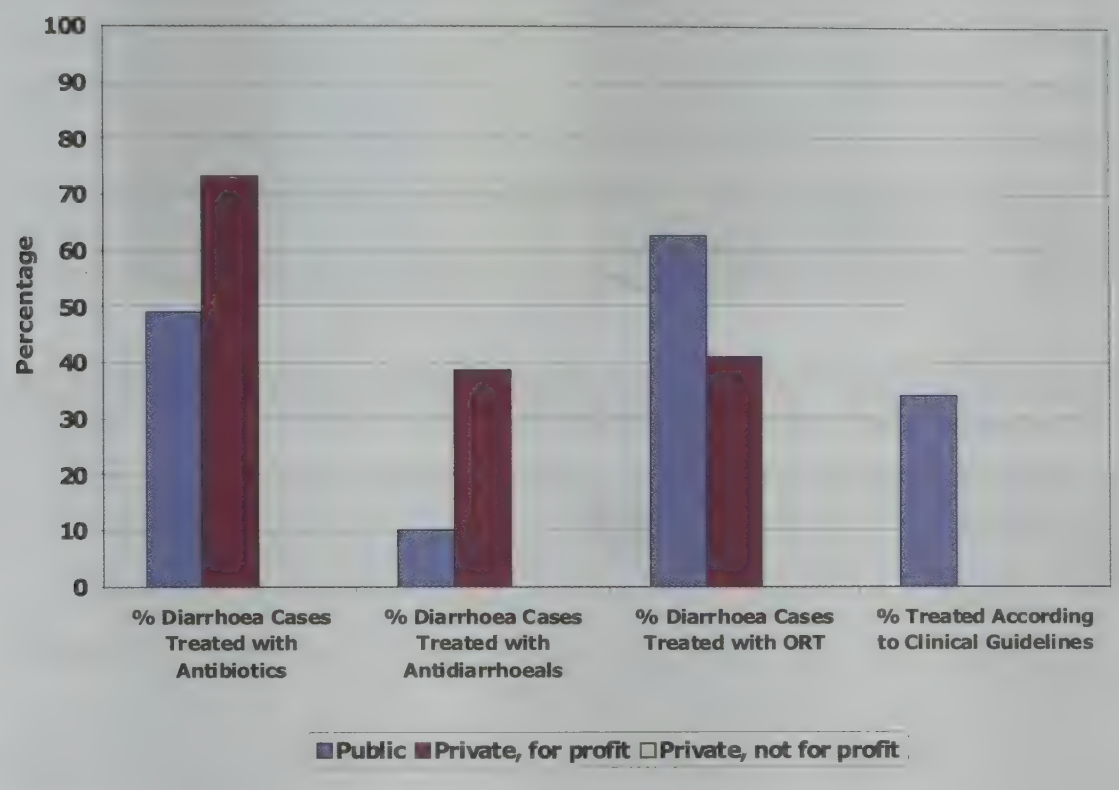


Key Points:

- Results from studies of medicines use suggest that prescribing for acute diarrhoea by paramedical health workers/nurses may be slightly better than by medical doctors according to all four practices assessed.
- The percentage of diarrhoea cases treated with antidiarrhoeals was lowest when the reported prescriber was a paramedical health worker/nurse.
- The percentage of diarrhoea cases treated with ORT was lowest when the reported prescriber was not a nurse or a medical doctor.
- The percentage of reported acute diarrhoeas treated according to clinical guidelines was below 40%, regardless of the type of prescriber.

Figure 7.6 presents results for acute diarrhoea treatment indicators by ownership of health-care facility. Only data from studies measuring prescribing of physicians, nurses, and paramedics are included in the figure. No studies that measured prescribing by these trained health providers in the private not-for-profit sector collected data for the acute diarrhoea treatment indicators in this category, so the graph does not present any results for this sector.

Figure 7.6: Diarrhoea treatment indicators including all studies of medicines use for acute diarrhoea, by health facility ownership (prescribing by physicians, nurses, and paramedics only)

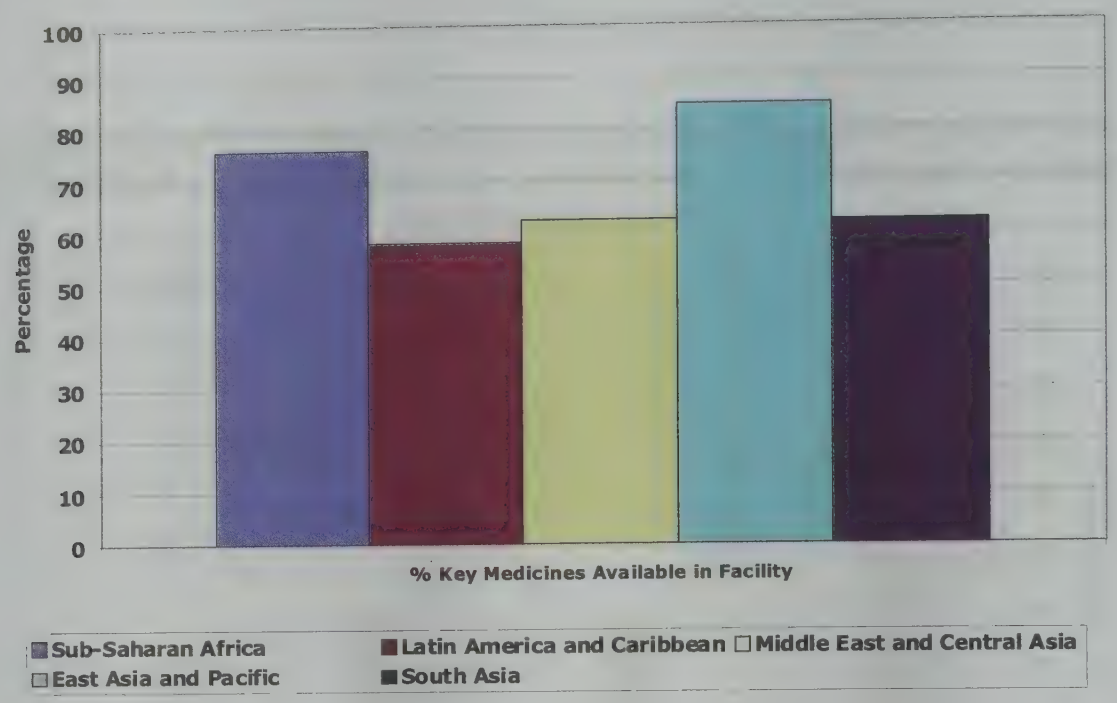


Key Points:

- Results from studies of medicines use in acute diarrhoea suggest substantially better prescribing patterns by physicians, nurses, and paramedics in public health-care facilities than in private for-profit health-care facilities.
- The percentage of reported cases of diarrhoea treated with ORT was much higher in studies from public health-care facilities (62%) compared to private for-profit health-care facilities (41%).
- The percentages of diarrhoea cases treated with antidiarrhoeals and antibiotics were much lower in studies from public health-care facilities than in studies from private for-profit health-care facilities.
- The percentage of acute diarrhoea cases treated according to clinical guidelines was only 40% in public health-care facilities; there were too few studies in the private sectors to evaluate this indicator.

Figure 7.7 summarizes the availability of medicines to treat diarrhoeal illness in studies that focused on the treatment of diarrhoea.

Figure 7.7: Availability of key medicines in studies of medicines use for acute diarrhoea, by World Bank region



Key Points:

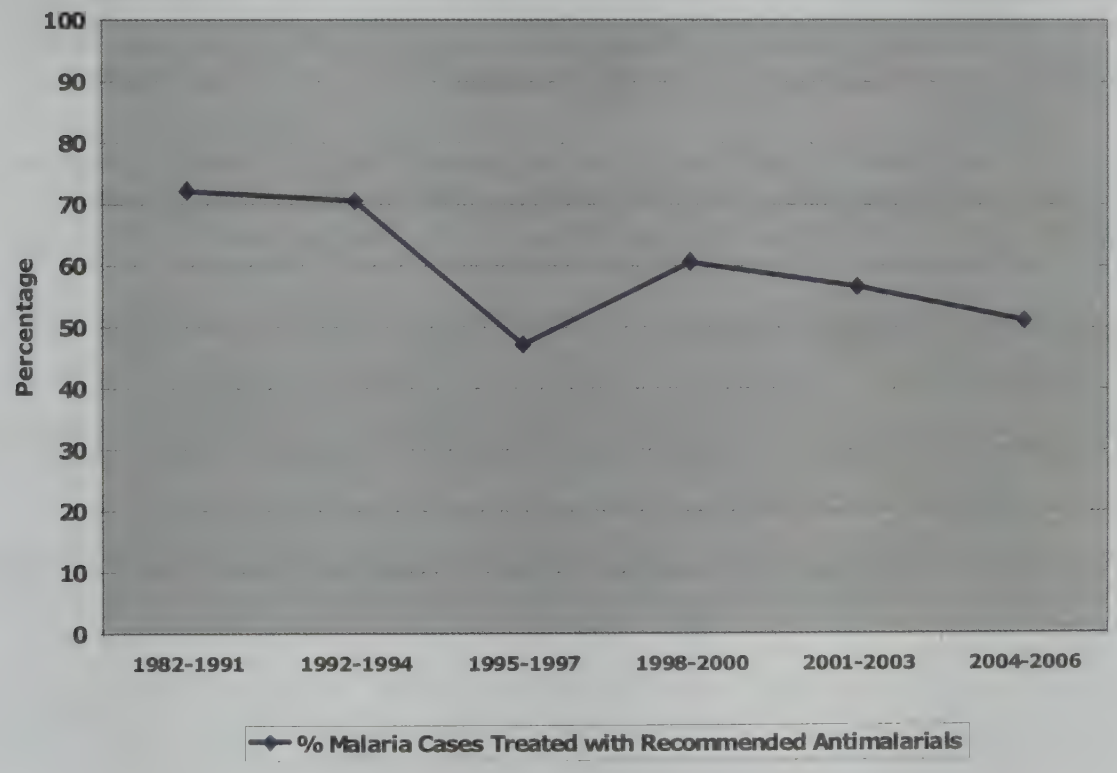
- The availability of key medicines to treat acute diarrhoea was below 90% in studies from all regions except the East Asia and Pacific region.
- Availability of medicines was particularly low in health facilities in Latin America and the Caribbean (58%) as well as in Middle East and Central Asia and South Asia (62%).

8. TREATMENT OF MALARIA

This section focuses on studies of medicines use that reported results about antimalarial treatment from data collected between 1982 and 2006. The percentage of malaria cases given recommended antimalarials was extracted from this subgroup of studies and is presented below to show patterns of antimalarial treatment over time. The indicator 'percent of malaria cases given recommended antimalarial' accounts for the choice of antimalarial medicine: it does not take into consideration whether dosing was correct. The 'recommended' attribute was defined by authors of the studies. Injectable antimalarials were considered not recommended, unless otherwise stated by authors of studies.

Figure 8.1 shows the percentage of malaria cases given recommended antimalarials in patients of all ages, over the chronological periods of data collection.

Figure 8.1: Prescribing of recommended antimalarial treatment over time, including all studies of antimalarial use

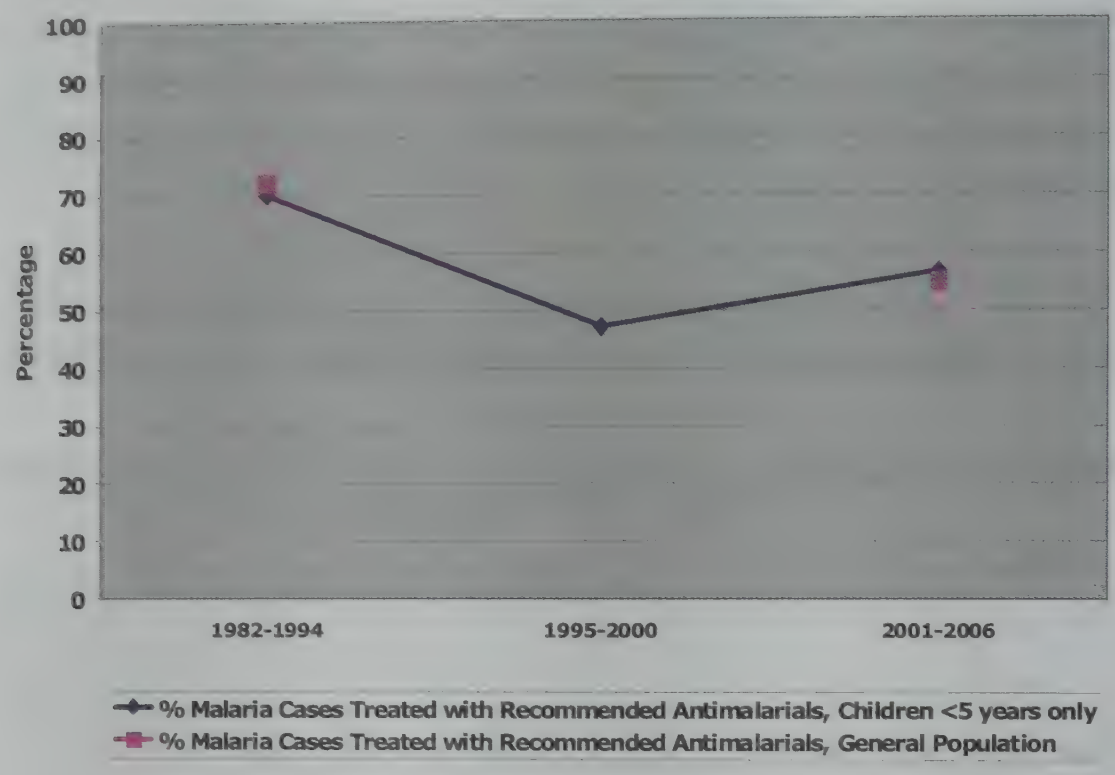


Key Points:

- Results from studies reporting antimalarial use suggest that patterns of antimalarial prescribing worsened during the overall period of data collection.
- One possible explanation for this negative trend may be changes in national malaria treatment policy that have occurred in the last 10 years aimed at fighting antimalarial resistance and the lag time inherent in implementing these changes.
- The percentage of reported malaria cases treated with recommended antimalarials in studies of antimalarial use was only 51% during the period 2004-2006.

Recent emphasis on malaria control and also the integrated management of childhood illness has resulted in many studies being conducted in children since 2000. **Figure 8.2** displays the percentage of malaria cases treated with recommended antimalarials over time from studies only including children under 5 years old with studies of patients of all other ages.

Figure 8.2: Prescribing of recommended antimalarial treatment over time, comparing studies of children <5 years versus studies of the general population



Key Points:

- Results from studies of medicines use in malaria suggest comparable trends in prescribing antimalarials for children < 5 years and the general population (adults and children) during recent periods of data collection.
- Between 1995 and 2006, the percentage of malaria cases treated with recommended antimalarials in children less than 5 years old increased by about 10%, to just under 60% of cases.
- Overall, the adequacy of antimalarial prescribing, as reported in studies of antimalarial use, has worsened since the 1982-1994 time period both in the general population (adults and children) and in children under 5 years old.

Most studies of medicines use in malaria were carried out in Africa in the context of primary care where the main prescriber was a nurse or paramedical health-care worker. Thus a description of prescribing patterns by region or prescriber type was not possible.

9. INAPPROPRIATE ANTIBIOTIC USE

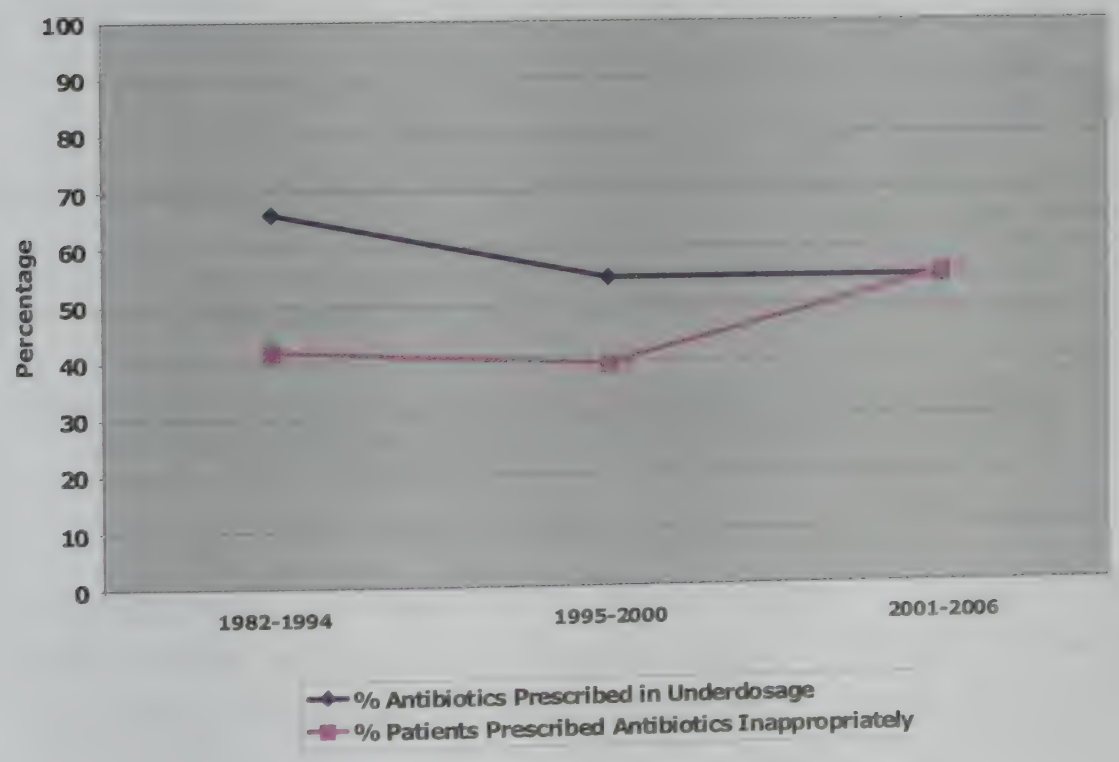
This section focuses on studies that reported results about antibiotic treatment. Two indicators of appropriateness of antibiotic use extracted from this subgroup of studies are presented below to illustrate patterns of appropriateness of antibiotic prescribing over time. The following indicators were evaluated:

- Percentage of patients prescribed antibiotics inappropriately. Inappropriate use was defined by the authors of each study. The measure reported here also included prescribing of antibiotics for acute diarrhoeal disease and URTI. The WHO/IMCI studies, which represent a large proportion of the studies from 1997 onwards, measured an indicator defined as the percentage of children not needing an antibiotic who leave the health facility with an antibiotic.
- Percentage of antibiotics prescribed in underdosage. Underdosage was usually reported in the studies according to duration only, but in some cases it was also documented in inappropriate strength and frequency.

9.1 Inappropriate antibiotic prescribing over time

Figure 9.1 presents the two indicators of antibiotic treatment over the chronological periods of data collection.

Figure 9.1: Inappropriate prescribing of antibiotics over time



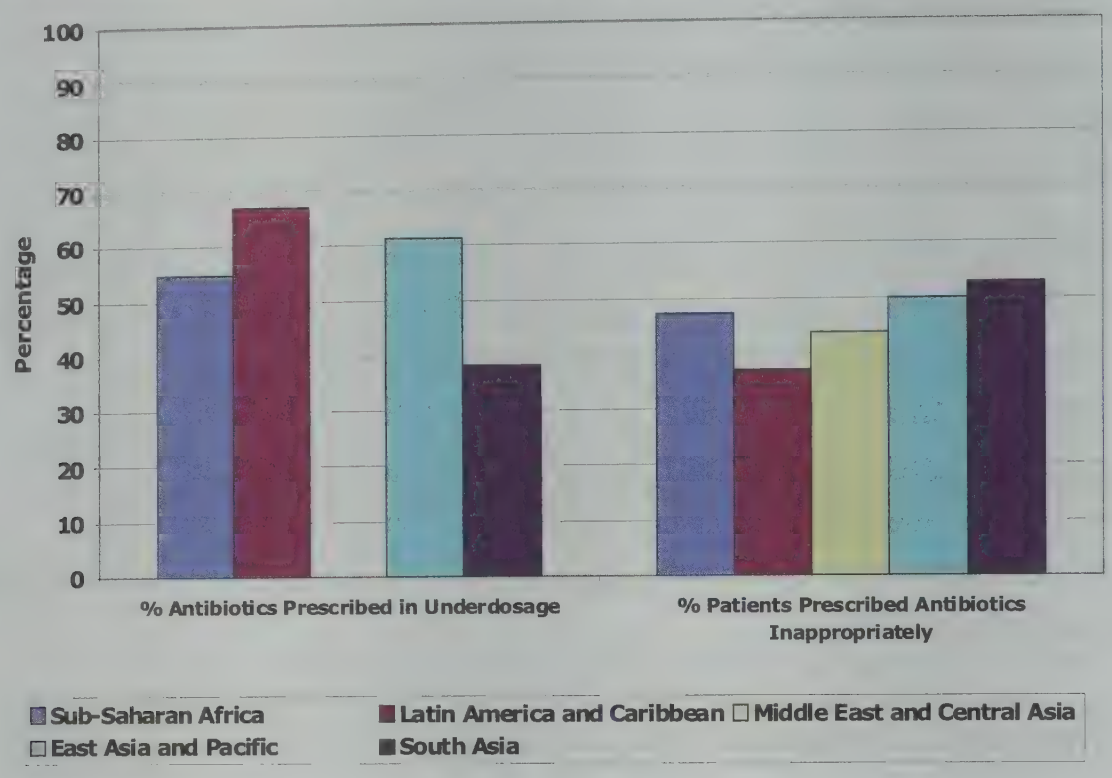
Key Points:

- Results suggest a large, persistent and growing problem of inappropriate use of antibiotics.
- The percentage of patients prescribed antibiotics inappropriately increased to over 50% in studies conducted between 2001 and 2006, up from 40% in earlier studies.
- The percentage of antibiotics prescribed in underdosage remained over 50% in all time periods.

9.2 Inappropriate antibiotic prescribing by region, facility ownership and type of prescriber

Figure 9.2 presents overall results of both indicators of inappropriate antibiotic treatment indicators by geographic region. The sample size of studies in the Middle East and Central Asia region for the first indicator is too small to display on the graph.

Figure 9.2: Inappropriate prescribing of antibiotics, by World Bank region

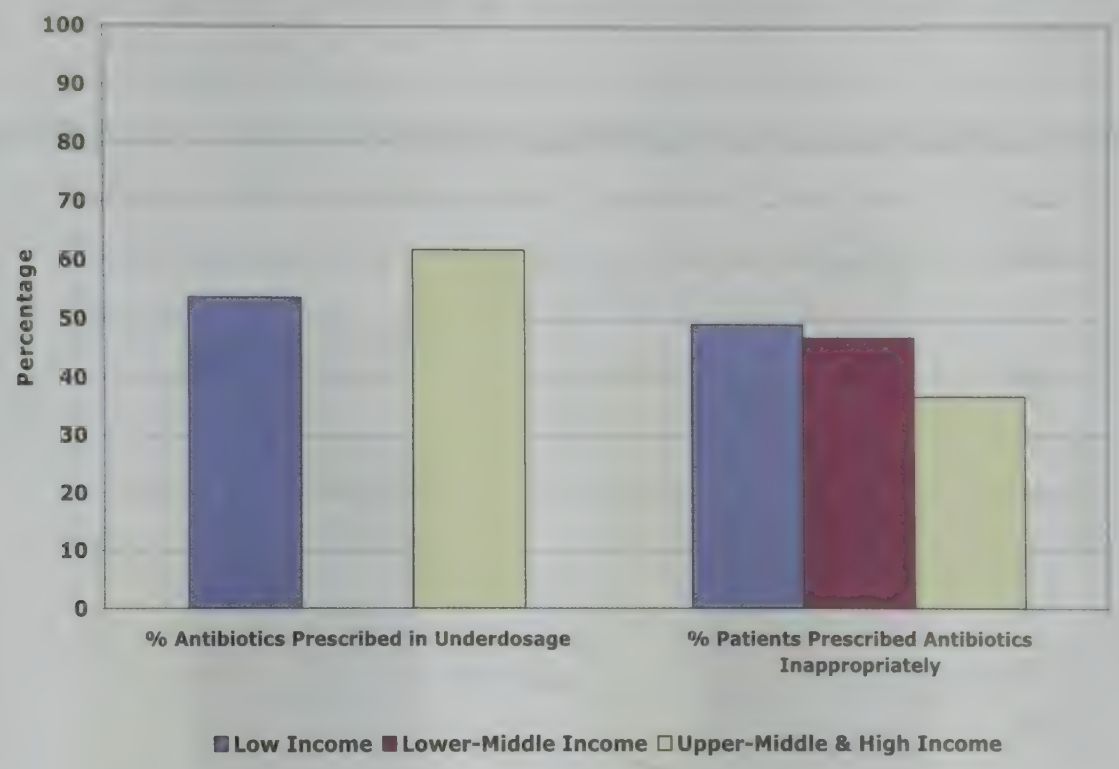


Key Points:

- Results suggest that inappropriate prescribing of antibiotics is a widespread problem in every geographic region.
- In all regions except Latin America, over 40% of reported prescriptions of antibiotics were inappropriate, with countries in South Asia having the highest rates of inappropriate antibiotic use.
- In Latin America, prescribing insufficient doses of antibiotics was reported more frequently than in other regions: 67% of antibiotics prescribed were dosed incorrectly.

Figure 9.3 presents overall results of the antibiotic prescribing indicators by the World Bank income level of the countries in which the studies were conducted. The sample size of studies in the lower-middle income region for the first indicator is too small to display on the graph.

Figure 9.3: Inappropriate prescribing of antibiotics, by World Bank income level

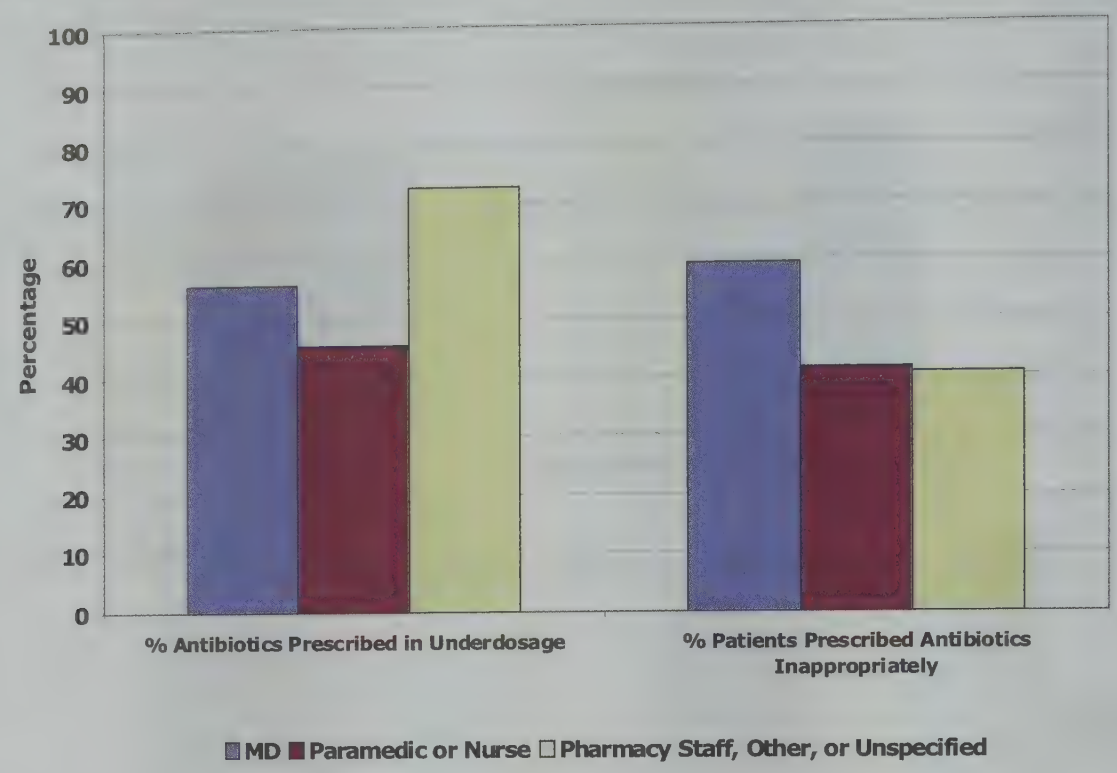


Key Points:

- The percentage of antibiotics prescribed in under dosage was slightly higher in studies from upper-middle and high income countries; over 60% of prescribed antibiotics in this income group were at inappropriately low doses.
- The lowest rates of patients prescribed antibiotics inappropriately were seen in upper-middle and high income countries, although over one third of patients there received antibiotics inappropriately.

Figure 9.4 presents overall results of antibiotic treatment indicators averaged by type of prescriber.

Figure 9.4: Inappropriate prescribing of antibiotics, by type of prescriber

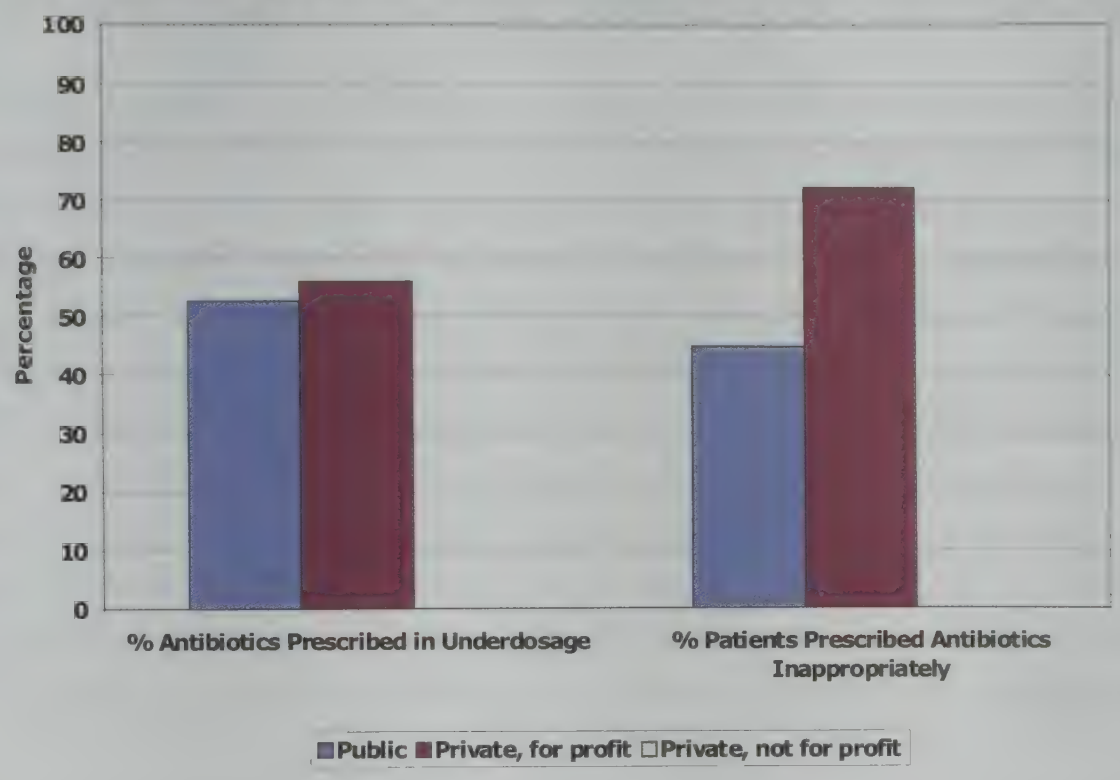


Key Points:

- Results of studies of medicines use suggest unsatisfactory antibiotic prescribing patterns by all cadres of health worker.
- Over 40% of antibiotics were prescribed in underdosage by all types of health providers.
- The percentage of patients prescribed antibiotics inappropriately was highest when the reported prescriber was a medical doctor.

Figure 9.5 presents the overall results of the antibiotic treatment indicators by health-care facility ownership, including only those studies that measured prescribing by physicians, nurses, or paramedics. The number of studies conducted in the private not-for-profit sector was insufficient to evaluate antibiotic use in this sector.

Figure 9.5: Inappropriate prescribing of antibiotics, by health-care facility ownership (prescribing by physicians, nurses, and paramedics only)



Key Points:

- Results from studies of inappropriate antibiotic prescribing by physicians, nurses, and paramedics suggest better antibiotic prescribing patterns in public health-care facilities than in private for-profit health-care facilities.
- The prescribing of antibiotics in under dosage was slightly higher in private for-profit facilities than in public facilities (56% versus 53%) and the percentage of patients prescribed antibiotics inappropriately was markedly higher in the private for-profit sector (72% versus 45%).

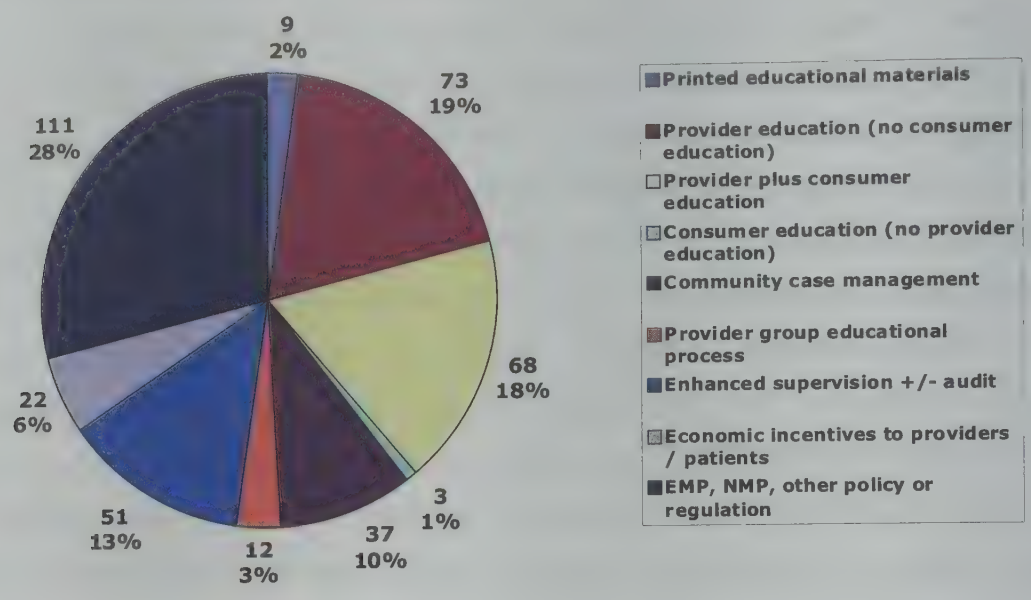
10. INTERVENTIONS TO IMPROVE USE OF MEDICINES

This section focuses on studies examining use of medicines that included an intervention. These studies varied widely in the types and scope of the interventions investigated. Many studies tested the impact of prospective efforts to improve prescribing in small samples of health facilities, health providers, or patients. However, some community case management studies examined the impact of large prospectively designed interventions in improving how specific common health problems were managed in order to reduce mortality. The interventions in the database also include several different types of system-based interventions, including changes in financial incentives to health providers or patients, implementation of the IMCI strategy, or changes in medicines formularies. Finally, a number of studies have examined the impact of implementation of a national policy, such as a National Medicines Policy or an Essential Medicines Programme.

10.1 Overview of interventions to improve medicines use

For the period 1990-2006, the database includes information about 386 interventions to improve use of medicines that were evaluated in 317 studies. **Figure 10.1** shows the distribution of these interventions, classified according to the component that best captures the nature of the intervention strategy evaluated.

Figure 10.1: Types of intervention studies classified by dominant intervention component



Key Points:

- Overall, 37% of the 386 interventions in the database tested an educational programme directed at health providers; about half of these interventions also included consumer or patient education.
- One in ten interventions tested community case management strategies aimed at preventing mortality from ARI, diarrhoea, or malaria, typically involving provider and community education, training of community health workers, and community availability of essential medicines.
- The largest single group of studies represented in the database included surveys to measured medicine indicators during the implementation of an NMP, EMP, or another regulatory strategy; most commonly these were one time cross-sectional studies to measure whether the policy was achieving its intended effects.
- An increasing number of interventions (13% of those in the database) include enhanced supervisory programmes, with or without routine audits of health provider practices; these approaches are frequently used in the implementation in the IMCI programme as a strategy to improve the performance of lower level health workers.

Although some studies have tested a specific type of single component intervention (such as a one-time provider training seminar), many have incorporated several educational, managerial, financial, or regulatory components. **Table 10.1** below shows the individual components that were part of these interventions.

Most interventions of every type involved a mix of components. Only the interventions that evaluated the effects of economic incentives directed at health providers or patients tended not to include other strategies.

Two-thirds of all interventions reported using printed educational materials, but only nine interventions tested the efficacy of these materials as a specific component of the study. Generally, almost all studies with educational activities directed at health providers used some type of printed materials; a smaller percentage of the behaviour change interventions that targeted consumers, patients, and the community reported using printed materials.

The interventions classified as group educational process incorporated educational programmes for health providers, including peer review or self-monitoring of prescribing practices, typically combined with guidelines or other printed educational materials. One in five of these studies also included enhanced health worker supervision. Interventions that were classified as supervision with or without practice audits were similar in design, except that they did not include a specific group educational process.

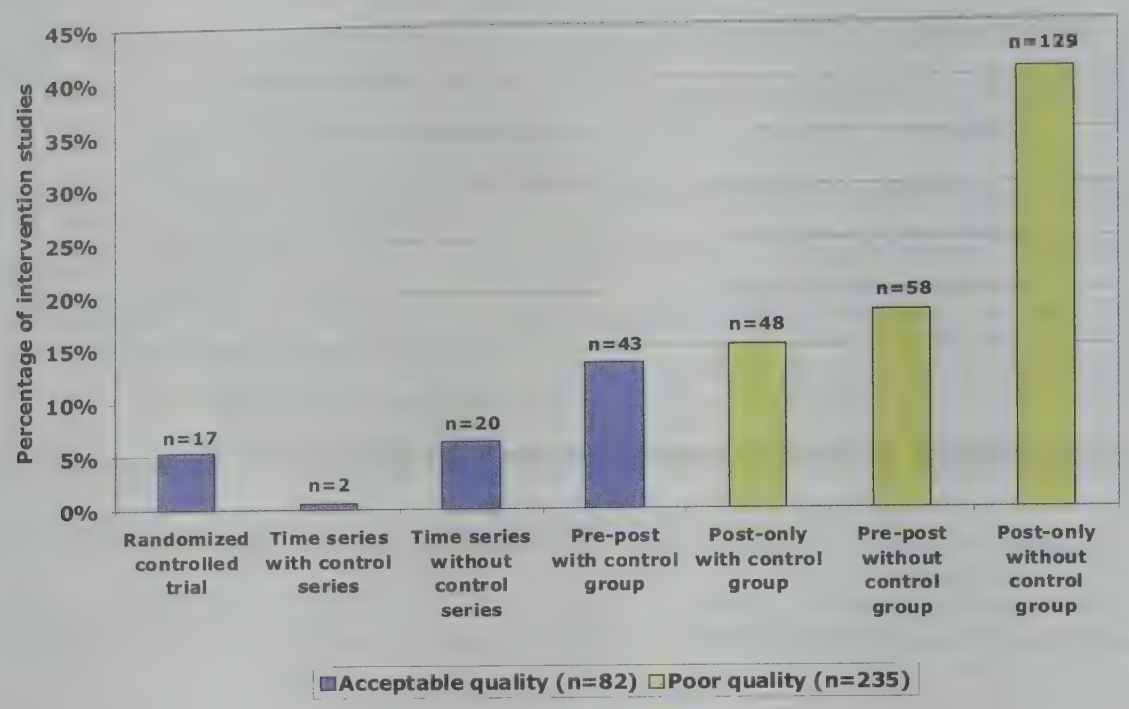
The studies conducted in the context of an NMP or EMP included a diverse mix of intervention components, reflecting the broad-based strategies typically implemented as part of these programmes. Because of their diversity, these studies are more difficult to characterize.

Table 10.1: Individual approaches included in different types of interventions

			Percentage of interventions of each type that include:								
Intervention type classified by dominant component	Number of interven-tions	Percent of interven-tions	Print materials	Provider education	Consumer/ patient education	Commu-nity case manage-ment	Group provider education process	Enhanced super-vison +/- audit	Economic incentives	EMP or NMP	Other regulation
Printed educational materials	9	2%	100%	0%	0%	0%	0%	0%	0%	11%	0%
Provider education	73	19%	84%	100%	0%	0%	0%	0%	0%	3%	1%
Provider and consumer/ patient education	68	18%	84%	100%	100%	0%	4%	29%	0%	3%	0%
Consumer/patient education	3	1%	33%	0%	100%	0%	0%	0%	0%	0%	0%
Community case management	37	10%	32%	73%	81%	100%	0%	70%	8%	70%	11%
Provider group educational process	12	3%	92%	92%	8%	0%	100%	17%	0%	8%	17%
Enhanced supervision +/- audit	51	13%	76%	88%	0%	0%	0%	100%	0%	4%	0%
Economic incentives to providers / patients	22	6%	5%	9%	0%	0%	0%	5%	100%	0%	0%
EMP, NMP, other national policy or regulation	111	29%	60%	64%	33%	0%	1%	40%	14%	91%	6%
All interventions	386	100%	67%	77%	36%	10%	4%	37%	10%	35%	4%

Figure 10.2 shows the types of study designs that were used to evaluate the interventions included in this review.

Figure 10.2: Types of study designs in studies to evaluate medicines use interventions, by methodological quality

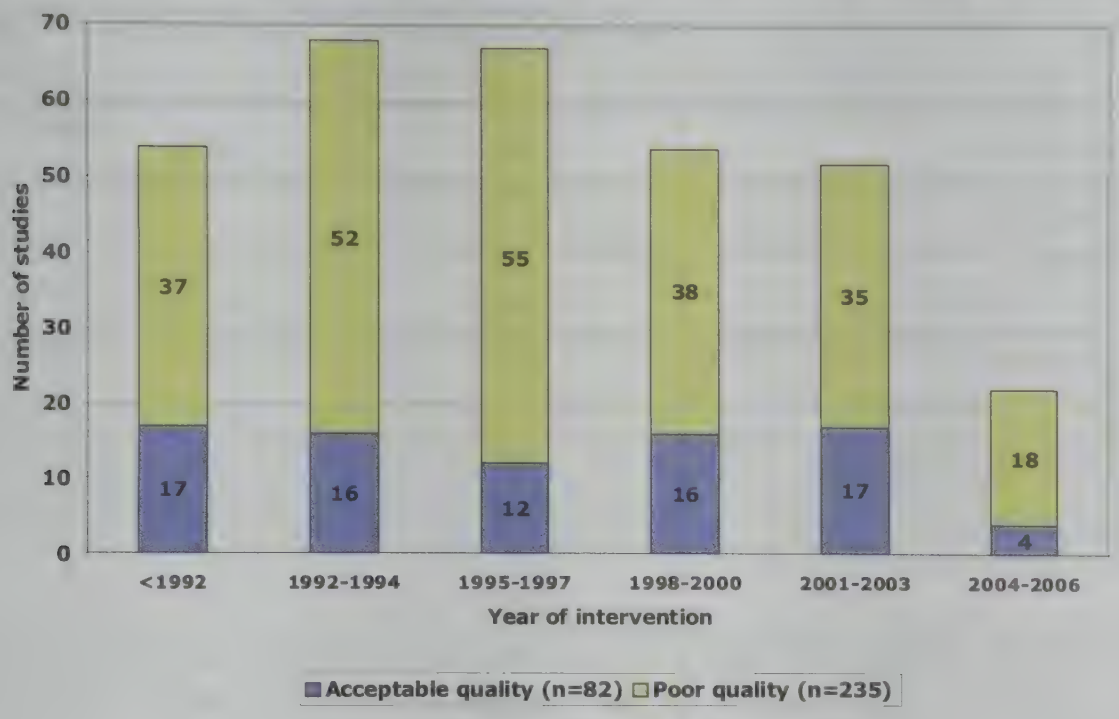


Key Points:

- Of the 317 intervention studies included in the database, only 82 (26%) were evaluated using a research design that is considered methodologically adequate for drawing reliable conclusions about intervention impacts.
- Overall, 41% of studies were evaluated using post-only without control group designs that did not include either a control group or measurement before and after the intervention; another 18% had pre- and post-measurement but no controls, while 15% used a control group but measured the medicines use indicators only after the intervention was completed.
- The methodologically adequate research designs included randomized controlled trials (n=17, 5% of studies), time-series with control groups (n=2, 1% of studies) or without control groups (n=20, 6% of studies), and pre-post studies with control groups (n=43, 14% of studies).

As shown in **Figure 10.3**, the overall quality of studies testing interventions to improve the use of medicines has not improved substantially over time, and the majority of studies are still of poor methodological quality.

Figure 10.3: Methodological quality of intervention studies by time period



Key Points:

- There was an increase in the overall volume of reported research on interventions to improve medicines use in the mid-1990s, but the number of available studies has declined in the last 10 years.
- The quality of the research designs has not improved markedly over time; 25% of studies up to the year 2000 had acceptable designs, compared to 28% of studies since then.

Table 10.2 presents data on the distribution of the intervention research studies included in the database by geographic region, country income, health facility ownership and prescriber type. Although there are intervention studies from all geographic regions, about one third of the studies of acceptable quality come from Sub-Saharan Africa, another third from South Asia, and an additional 20% from the Asia Pacific region. Relatively little well-designed research on improving medicines use has been reported from the non-industrialized countries in Latin America, Europe, Central Asia, or the Middle East. About 70% of well-designed studies have been conducted in poor countries and only 7% in upper-middle or high income countries.

Over 70% of all studies, and over 60% of those with adequate research designs, were conducted in public sector health facilities. In all, only 12 well-designed studies have been reported that examined strategies to improve practice in the private for-profit sector, while another 12 studies have tested ways to improve self-medication. About half of the existing research has examined interventions to improve the practices of nurses or paramedics, while physicians were the primary focus in about one-quarter of studies.

Table 10.2: Distribution of intervention studies by World Bank Region, country income, health facility ownership, prescriber type

	Acceptable quality	Poor quality	All studies
Number of studies	**82**	**235**	**317**
World Bank Region			
Sub-Saharan Africa	28 34%	103 44%	131 41%
Europe and Central Asia	2 2%	6 3%	8 3%
Latin America and Caribbean	6 7%	38 16%	44 14%
Middle East and North Africa	3 4%	17 7%	20 6%
South Asia	27 33%	34 14%	61 19%
East Asia and Pacific	16 20%	37 16%	53 17%
World Bank Country Income			
Low income	57 70%	137 58%	194 61%
Lower-middle income	19 23%	63 27%	82 26%
Upper-middle & high income	6 7%	35 15%	41 13%
Health Facility Ownership			
Private, for profit	12 15%	19 8%	31 10%
Private, not for profit	1 1%	1 0%	2 1%
Public	50 61%	179 76%	229 72%
Not applicable, self-medication	13 16%	21 9%	34 11%
Unspecified	6 7%	15 6%	21 7%
Prescriber Type			
MD	19 23%	52 22%	71 22%
Paramedic or nurse	39 48%	141 60%	180 57%
Pharmacy staff	3 4%	6 3%	9 3%
Other	16 20%	29 12%	45 14%
Unspecified	5 6%	7 3%	12 4%

In addition to study design, another key aspect of methodological quality of a study is the overall size of the samples of prescribing and dispensing episodes assessed, and the number of health facilities and providers participating in the intervention. Studies that involve only small samples of patients or facilities may not be reliable or representative.

The studies in the database were conducted in a diverse array of settings. Some were focused and targeted specific providers and patients, while others represented research about the impacts of broad policy approaches; thus, it is challenging to characterize the adequacy of their samples. Table 10.3 presents a rough classification of the total numbers of patients or cases surveyed in each wave of data collection and the total number of health facilities included in all intervention groups the study.

Table 10.3: Numbers of patients and health facilities included in the basic samples of intervention studies, by quality of research design

Quality of design	No. of facilities	Number of patients in total sample					Total	
		<100	100-999	1000-9999	10,000 +	NA	Number	Percent
Acceptable design	1	0	0	0	0	1	1	1%
	2-5	0	1	4	0	1	6	7%
	6-10	1	3	3	1	1	9	11%
	11-20	0	2	7	3	2	14	17%
	21-99	0	5	13	8	3	29	35%
	100 +	0	4	2	1	0	7	9%
	NA	0	2	2	3	9	16	20%
Total	Number	1	17	31	16	17	82	100%
	Percent	1%	21%	38%	20%	21%	100%	
Poor design	1	0	8	3	4	0	15	6%
	2-5	1	7	1	0	0	9	4%
	6-10	1	10	2	0	1	14	6%
	11-20	2	8	10	1	2	23	10%
	21-99	16	75	15	3	13	122	52%
	100 +	0	13	6	1	4	24	10%
	NA	2	7	8	3	8	28	12%
Total	Number	22	128	45	12	28	235	100%
	Percent	9%	54%	19%	5%	12%	100%	

The range of sample sizes has varied widely in both acceptably and poorly designed interventions. The most frequent well-designed intervention involved a total sample (combining all intervention groups) of over 1000 patients and more than 20 health facilities. Although poorly designed and well-designed studies have involved similar numbers of health facilities, studies with better designs tend to survey larger numbers of patients; 78% of well-designed studies have samples of more than 1000 patients, while only 37% of poorly designed studies measure practices in this many patients.

Because small studies may pose a greater risk of spurious positive results, in analyses examining the effects of interventions, we will examine the sensitivity of results to exclusion of the 11 well-designed interventions tested in 8 studies with fewer than 100 patients or 6 health facilities.

Table 10.4 displays the wide array of indicators that have been measured in intervention studies.

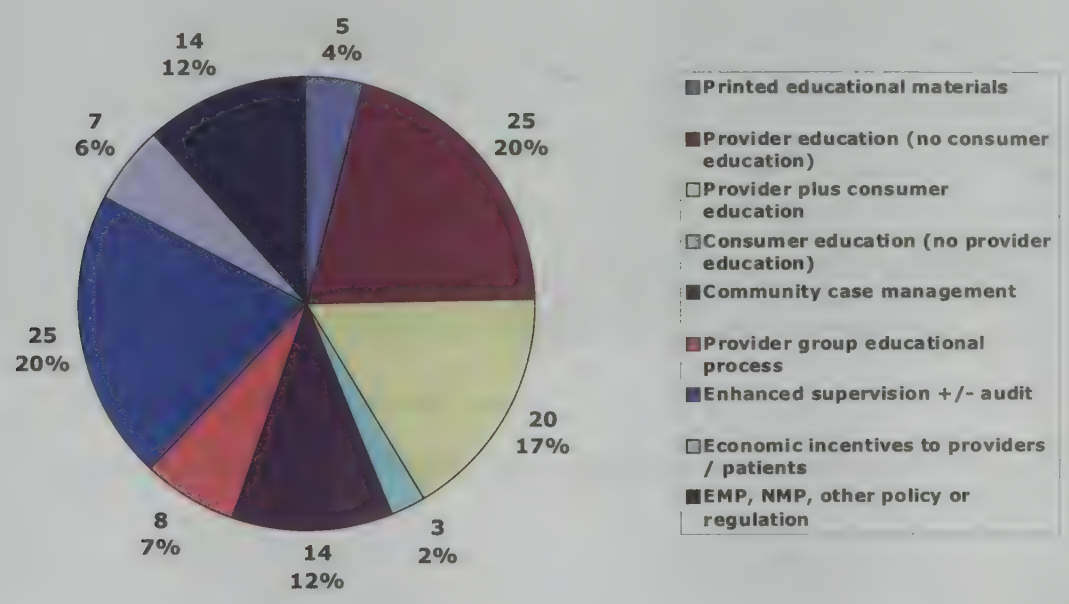
Table 10.4: Proportion of intervention studies measuring each medicines use outcome recorded in the database, by study quality

Indicator group	Acceptable quality	Poor quality	All studies
Total number of studies	**82**	**235**	**317**
Appropriate prescribing			
Avg. no. medicines per patient	61%	28%	36%
% patients prescribed antibiotics	56%	27%	35%
% patients prescribed injection	41%	20%	25%
% injections inappropriate	2%	1%	1%
% prescribed from EML	20%	11%	14%
% prescribed by generic name	23%	11%	14%
% patients treated by STG	48%	59%	56%
% treated without medicines	1%	2%	2%
Avg. drug cost per patient	22%	12%	15%
% patients prescribed vitamins/tonics	6%	2%	3%
Appropriate patient care			
Avg. consultation time	12%	9%	9%
Avg. dispensing time	10%	7%	8%
% patients given dosing instructions	13%	34%	29%
% patients who know regimen	11%	43%	35%
% medicines adequately labeled	10%	7%	8%
% patients satisfied with treatment	0%	0%	0%
Health facility resources			
% facilities with EML available	9%	4%	5%
% facilities with STG available	1%	20%	15%
% facilities with impartial information	1%	1%	1%
% key medicines available	23%	26%	25%
% specific recommended medicines available	0%	23%	17%
% prescribed medicines dispensed	11%	10%	10%
Community case management			
Overall mortality rate	9%	2%	4%
ARI mortality rate	4%	3%	3%
Diarrhoea mortality rate	2%	1%	1%
Malaria mortality rate	1%	0%	0%
Treatment of specific conditions			
% with antidiarrhoeal for diarrhoea	23%	13%	15%
% with antibiotic for diarrhoea	33%	20%	24%
% with ORT for diarrhoea	39%	31%	33%
% URTI treated with antibiotic	28%	18%	21%
% antibiotics for pneumonia	17%	33%	29%
% cough syrup for ARI	12%	4%	6%
% prescribed appropriate antimalarial	9%	19%	16%
% iron-folate in pregnancy	4%	0%	1%
Antibiotic use			
% antibiotics inappropriate	7%	20%	16%
% antibiotics underdosed	4%	2%	3%
% drug cost on antibiotics	0%	0%	0%

The most common behaviours targeted by well-designed interventions are general indicators of appropriate prescribing, including number of medicines per patient (60% of interventions), prescribing of antibiotics (55 percent), and prescribing according to standard treatment guidelines (47 percent). Over one-third of intervention studies targeted treatment of diarrhoea, and about one-fourth addressed treatment of URTI and pneumonia. Treatment of these two conditions in children is commonly targeted as part of the implementation of IMCI programmes.

Figure 10.4 arrays the 121 interventions with adequate research designs according to the primary type of intervention employed.

Figure 10.4: Interventions of adequate methodological quality classified by dominant intervention component



Key Points:

- The database contains information about 121 interventions tested in 82 well-designed studies.
- Two thirds of well-designed studies (a total of 70 interventions) assess the impacts of provider education with or without consumer education or enhanced supervision.
- Reflecting the difficulty of designing a valid longitudinal policy assessment, the database contains only 14 adequately designed studies of the impacts of Essential Medicines Programmes, National Medicines Policies, or other national regulations.
- Despite the importance of economic factors as determinants of medicines use among both prescribers and patients, there are only 7 methodologically sound assessments of the impacts of changes in economic incentives.

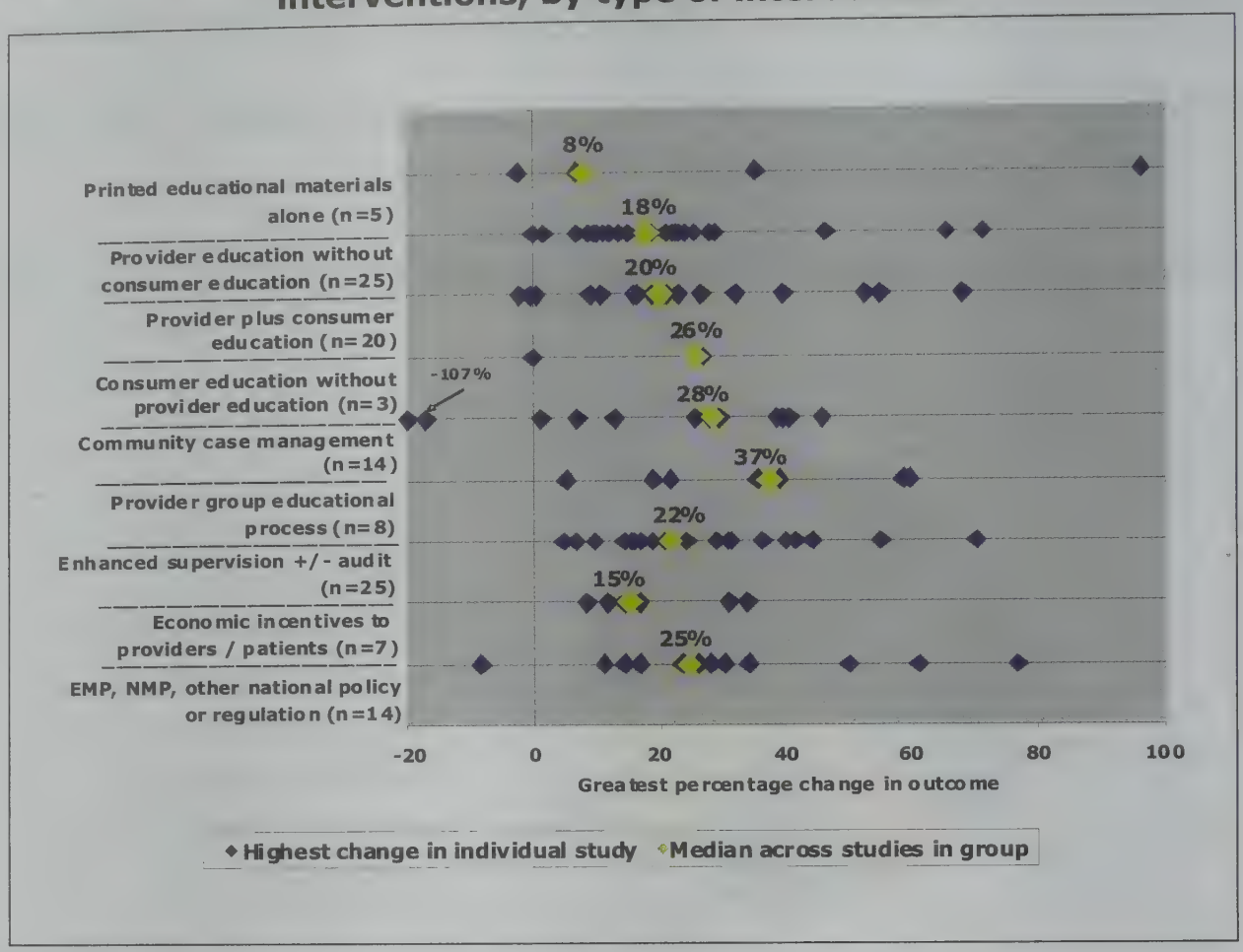
10.2 Impact of well-designed interventions to improve medicines use

Focusing on the 121 interventions with adequate study designs, two different measures of effect were used to characterize the impact of interventions:

- The greatest positive percentage change (calculated as described in the Methods section) reported in the study for one of the primary outcome indicators identified by study investigators;
- The median percentage change in all of the outcomes measures that were captured in the database.

Figure 10.5 shows estimates of the first measure of effect, namely, the greatest percentage changes attributed to all well-designed interventions, as well as the median effect size across all studies in each intervention group. All indicators have been scaled such that a positive change is desirable.

Figure 10.5: Largest reported percentage change in any study outcome for all interventions, by type of intervention



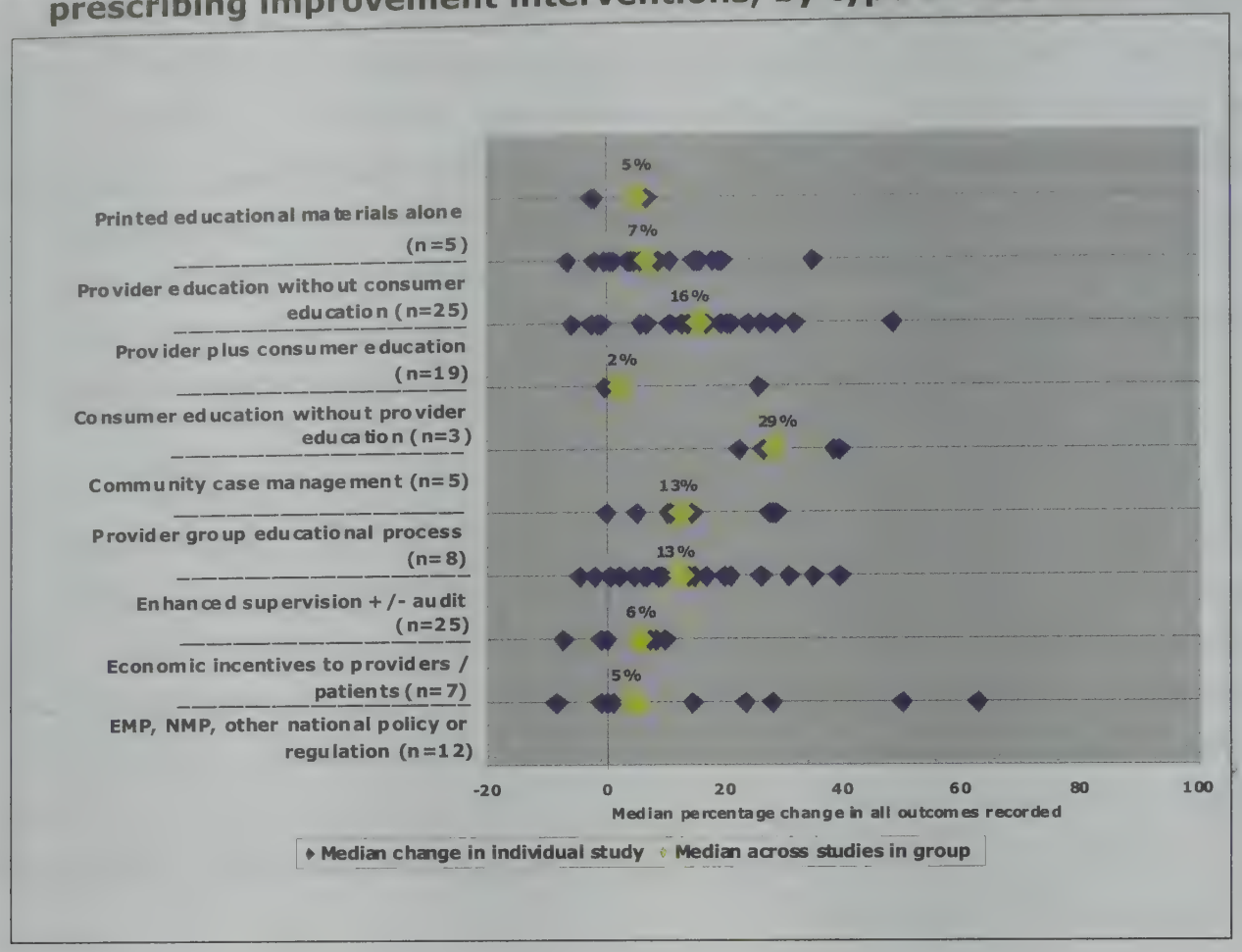
Key Points:

- The median of the largest effect sizes across all 121 studies was 21%, a magnitude of improvement consistent with prescribing interventions from industrialized countries. However, interventions reported a wide range of effects (25^{th}: 75^{th} percentiles were 14%:32%). Overall 23 of 121 studies reported positive effects lower than 10%.
- Excluding the 11 interventions with small samples had no effect on results; the median of the largest effect size remained 21% (25^{th}:75^{th} percentiles 13%:33%).
- Interventions built on group processes for health providers (such as peer review or group STG development) demonstrated the highest median positive effect (37%), and only one of the eight interventions reported a positive change of lower than 19%.
- The lowest median effect size (8%) was for interventions using only printed educational materials, a finding that is consistent with the failure of print materials to change prescribing in systematic reviews from industrialized countries. While a component of most interventions, printed materials tend to be ineffective by themselves.
- Interventions primarily based on the use of economic incentives to change prescribing reported the second lowest median effect size.
- For community case management intervention, approximately half the studies examined mortality rate and half prescribing outcomes; however, the median largest effect sizes in both types of study were similar.
- Interventions using provider and consumer education to improve the use of medicines included studies with and without enhanced supervision. The median largest effect size for provider and consumer education *without* supervision (13 studies) was 18% (25^{th}:75^{th} percentiles 7%:21%) and *with* supervision (7 studies) was 40% (25^{th}:75^{th} percentiles 23%:54%).
- The intervention group covering EMP, NMP, other national policy or regulation includes a diverse set of interventions. However, the EMP group differs from the other groups in having an element of medicines supply in the intervention. The median largest effect size for EMP (7 studies) was 27% (25^{th}:75^{th} percentiles 20%:45%), for NMP (6 studies) was 15% (25^{th}:75^{th} percentiles 14%:24%) and for regulation (1 study) was 24%.

Of the 121 interventions reported in Figure 10.5, 109 focused primarily on improving prescribing indicators, while the remaining 12 studies measured the effects on mortality rates of interventions to improve treatment of malaria, pneumonia, or diarrhoea. The studies focused on mortality reduction included 9 community case management studies, 2 studies evaluating national medicines policies, and 1 intervention involving provider and consumer education. The median largest effect sizes for the prescribing improvement and mortality reduction studies (21% vs. 19% respectively) were roughly similar. However, given the small number of mortality studies and their fundamental difference in focus, the results that follow include only the 109 interventions focused on prescribing improvement.

Figure 10.6 shows the estimated impacts of all well-designed prescribing improvement interventions for the second summary measure of effect, namely, the median change across all prescribing outcomes for a given study. Once again, all indicators have been scaled such that a positive change is desirable. On average, the database contains information on 4.0 outcomes per study. Studies examining the impact of consumer education reported substantially fewer prescribing outcomes (2.0) than other types of intervention, while studies of printed educational materials (7.4) reported substantially more.

Figure 10.6: Median reported percentage change across all study outcomes for prescribing improvement interventions, by type of intervention



Key Points:

- The median across all studies of the study-specific median change in outcomes was 9% (25^{th}:75^{th} percentiles 2%:20%), or less than half the size of the largest observed effect. Overall, 31 of 109 studies reported median effect sizes of 5% or less across all of the outcomes measured.
- Excluding the 11 studies with small sample sizes from the analysis again had no discernable effect on the median or range of effect sizes; the median effect size across the remaining 98 studies was 9% (25^{th}:75^{th} percentiles 3%:19%).
- Interventions that used a combination of provider and consumer education to improve use of medicines report a median 16% improvement across the outcomes they measured (an average of 2.4 outcomes per study); this is a 9% greater median positive impact than the 25 studies (measuring an average of 4.6 outcomes) which tested provider education alone.
- Many educational interventions targeting health providers include supervision as either a major or minor intervention component. On average, educational interventions targeting health providers that included enhanced supervision as either a major or minor intervention component (median improvement 14%, 25^{th}:75^{th} percentiles 7%:22%) had a 7% larger effect size than those that did not (median improvement 7%, 25^{th}:75^{th} percentiles 4%:16%).
- For the intervention group covering provider and consumer education to improve the use of medicines, the median effect size for provider and consumer education *without* supervision (12 studies) was 9% (25^{th}:75^{th} percentiles, -1%:+18%) and *with* supervision (7 studies) was 24% (25^{th}:75^{th} percentiles 18%:28%).
- For the intervention group covering EMP, NMP, other national policy or regulation, the median improvement in prescribing was 5% (for an average of 4.1 outcomes), suggesting that these broad based, multidimensional programmes may have modest positive impacts on an array of outcomes. However, within this group, the median effect size for EMP (5 studies) was 15% (25th:75th percentiles 1%:45%), for NMP (6 studies) was 5% (25th:75th percentiles 0%:15%) and for regulation (1 study) was 5%.

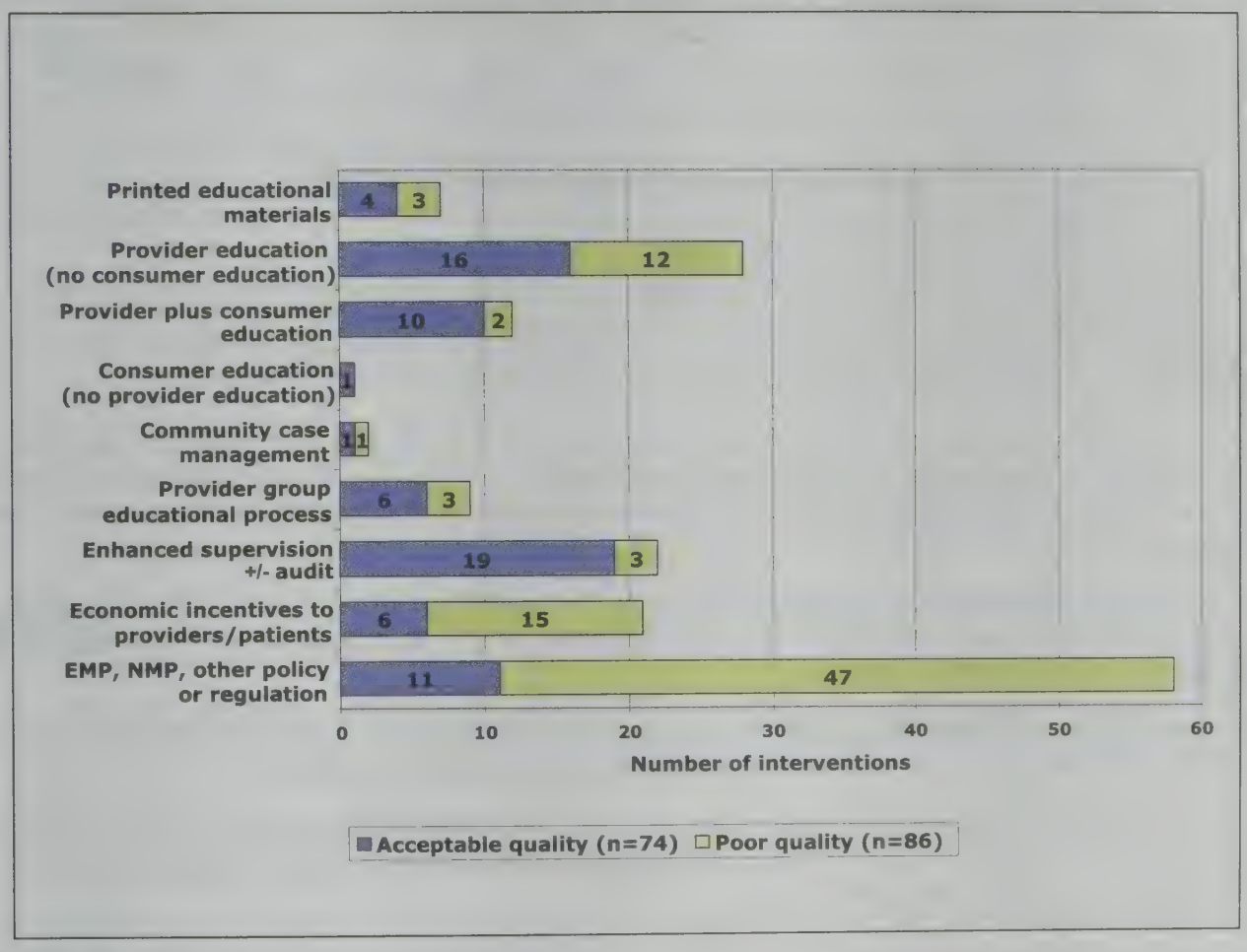
The median improvement across all reported indicators provides a more conservative estimate of intervention impacts than the largest reported impact. In subsequent analyses, we will adopt this conservative approach by reporting only the median effects across all the prescribing indicators reported in each study.

10.3 Comparison of paediatric and non-paediatric interventions

The database contains two distinct groups of interventions: 226 studies focused on improving the use of medicines for treating common health problems among sick children; and 160 studies that examine more general prescribing improvement interventions without a specific focus on paediatric health problems. These two groups of studies tend to have different intervention designs.

Figures 10.7 and 10.8 compare the intervention types and methodological quality of these two groups of non-paediatric and paediatric studies.

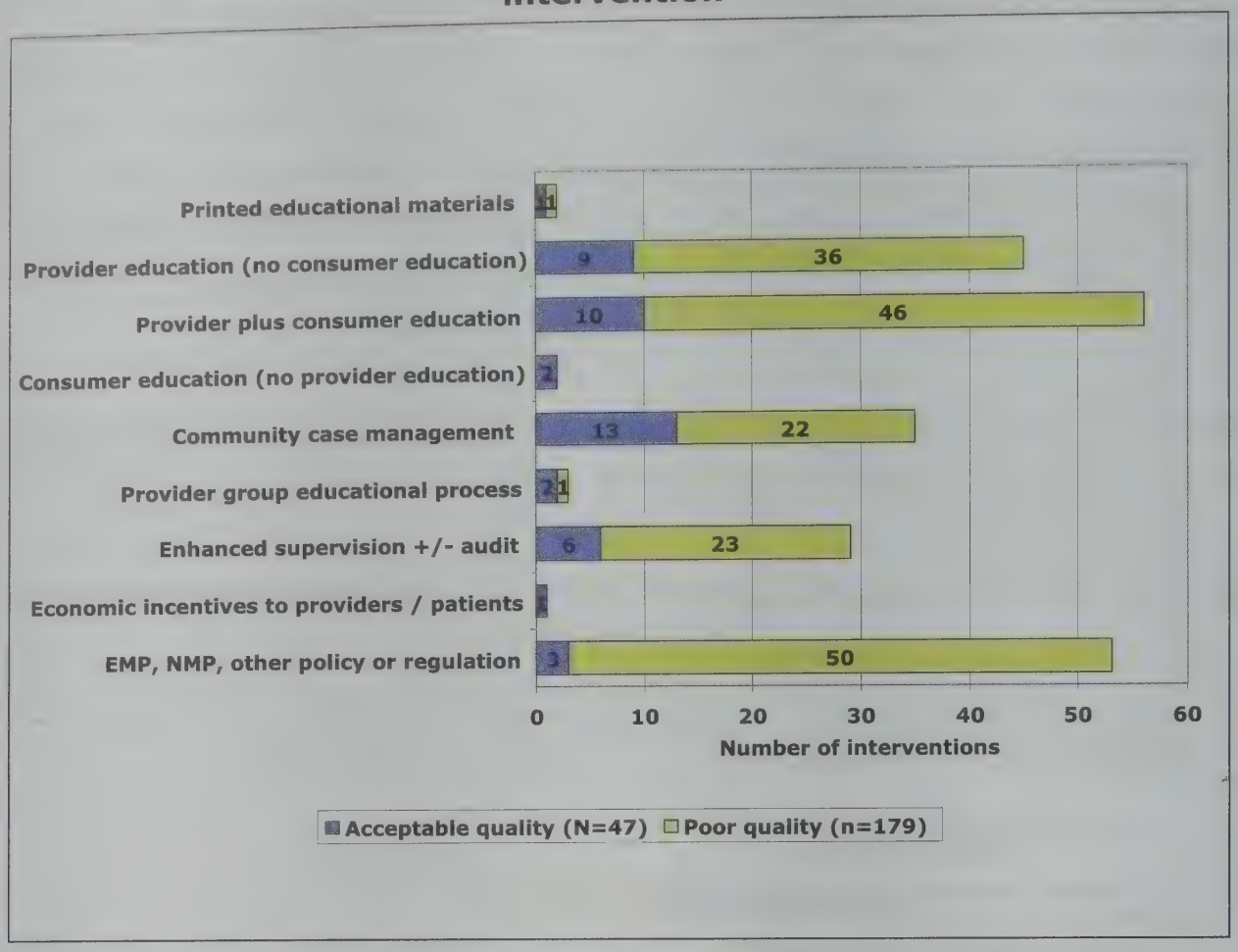
Figure 10.7: Quality of study designs used in non-paediatric interventions, by type of intervention



Key Points:

- Overall, 74 of the 160 non-paediatric studies (46%) had acceptable research designs; 73 of the 74 well-designed interventions targeted prescribing or patient care improvements, while 1 intervention targeted mortality reduction.
- Most of the non-paediatric interventions with poor research designs involved evaluations of EMP, NMP, or other national policies; only 1 in 6 of these interventions had a design that allowed it to be included in summary analyses of intervention effects.
- Over 70% of the studies of the impact of economic incentives on use of medicines also had poor research designs, with only 6 studies strong enough to be included in the summary analysis of impacts.
- The largest number of well-designed non-paediatric studies were those that measured the impacts of enhanced supervision and practice audits (19 studies), followed by studies of provider education (16 studies) or provider plus consumer education (10 studies).

Figure 10.8: Quality of study designs used in paediatric interventions, by type of intervention

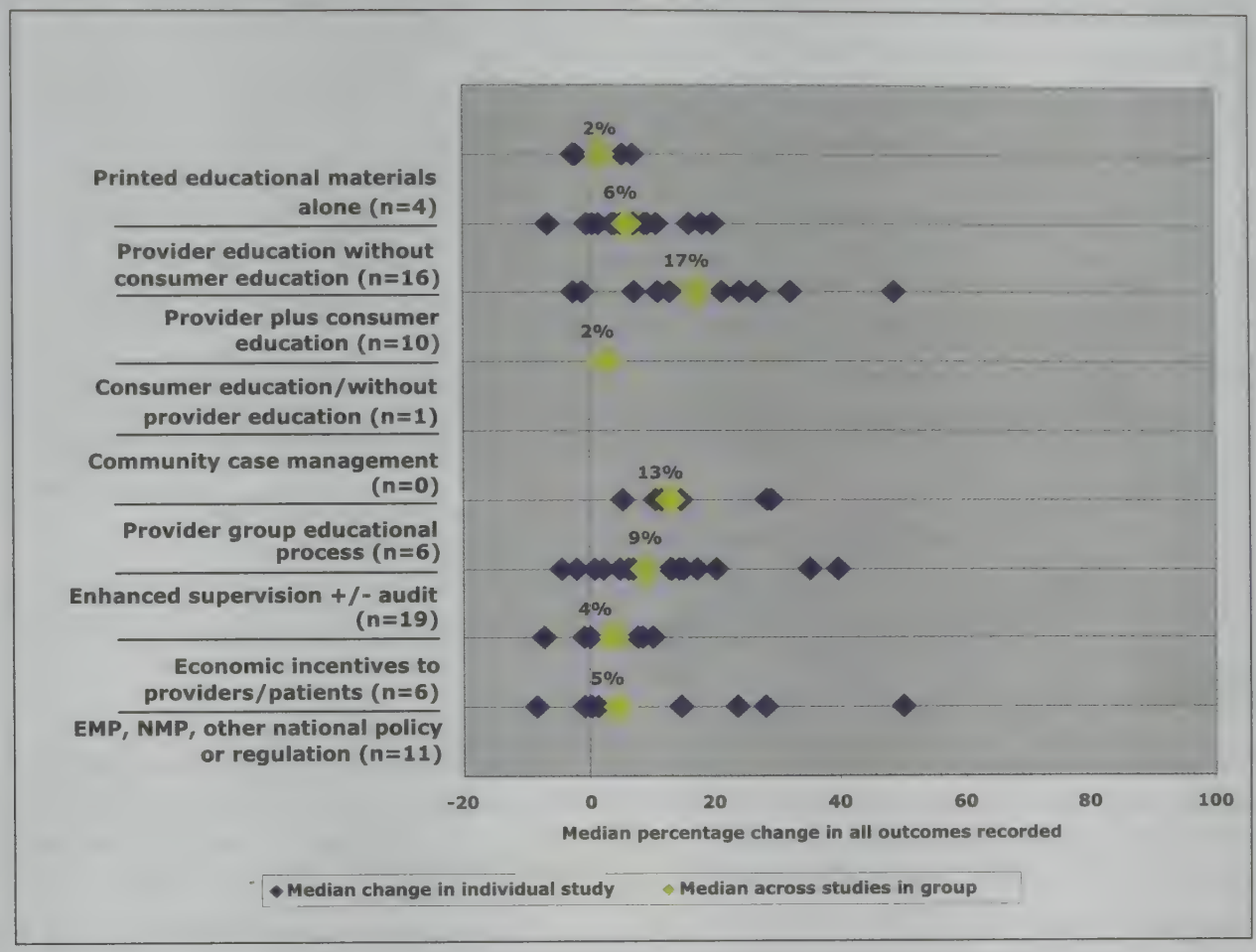


Key Points:

- Only 21% of the 226 paediatric intervention studies had acceptable research designs, in contrast to nearly half of the non-paediatric studies; 36 of the 47 well-designed interventions targeted prescribing or patient care improvements, while 11 interventions targeted mortality reduction. .
- A very large proportion of the evaluations of EMP, NMP, or other national policies had unacceptable research designs; only 6% of these interventions could be included in summary analyses of intervention effects.
- In contrast to non-paediatric studies, only a small proportion of the studies of enhanced supervision and provider education had acceptable research designs.
- The largest group of well-designed paediatric studies were interventions that focused on assessing the impact of community case management for ARI, diarrhoea, or malaria on mortality (9 studies) or prescribing (4 studies).

Figures 10.9 and 10.10 present the summary results separately for the non-paediatric and paediatric interventions. These figures once again exclude the 12 interventions focused mainly on mortality reduction, and they use the median of all prescribing outcomes as the summary measure of effect.

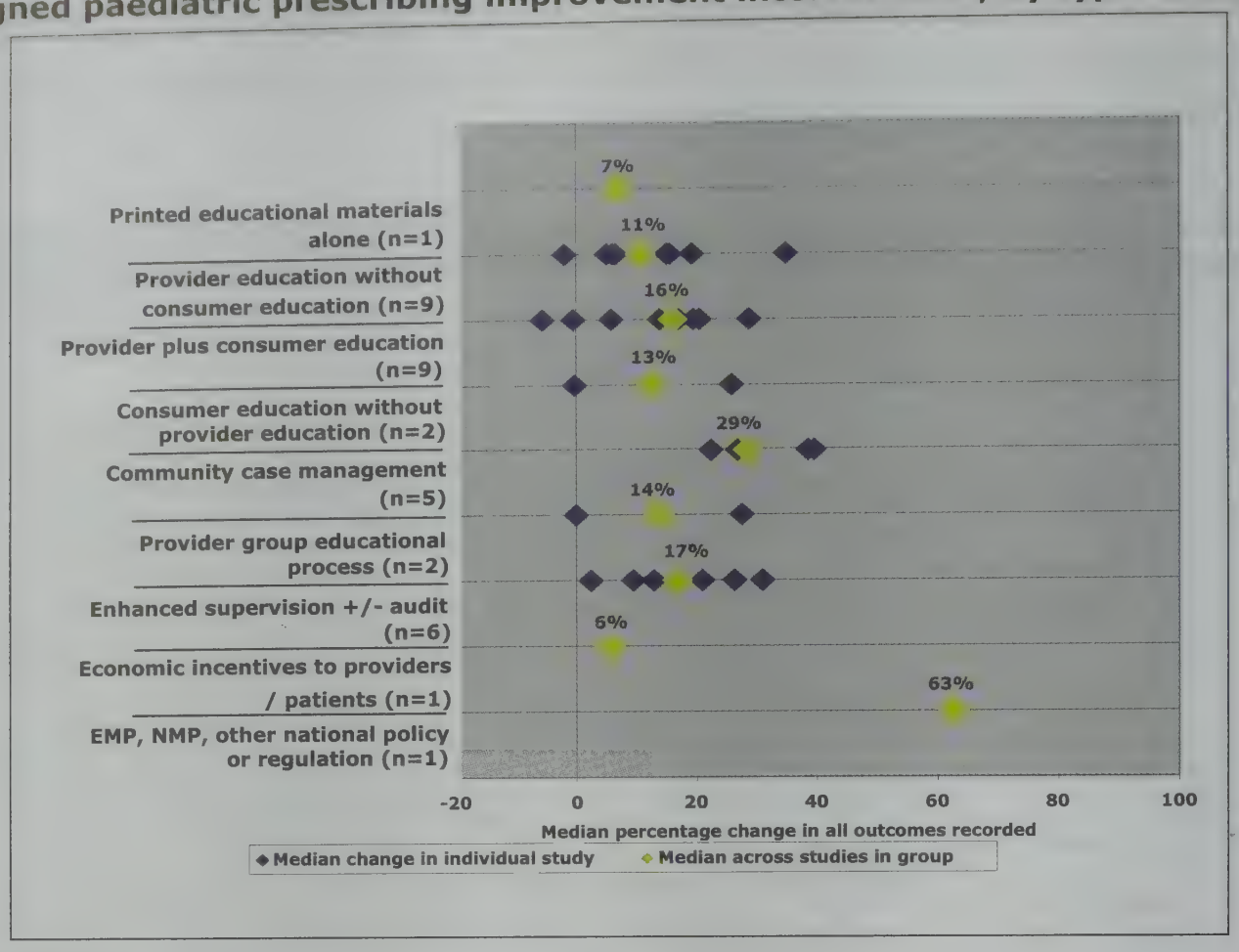
Figure 10.9: Median reported percentage change across all prescribing outcomes for well-designed non-paediatric prescribing improvement interventions, by type of intervention



Key Points:

- The median effect size in the non-paediatric interventions was 7% improvement in study outcomes (25^{th}:75^{th} percentiles 1%:15%). Overall, 25 of the 73 studies reported a median change of 5% or less across all prescribing outcomes.
- Although several categories have only a few studies, the overall estimates of median effects for most categories are modest (10% or less).
- The largest median effects were observed for interventions that combined several components, including interventions involving provider and consumer education (a median improvement in the indicators measured across studies of 17%), a provider group educational process (13%), followed by enhanced supervisory programmes (9%) and provider education alone (6%).
- Among the interventions that combined provider and consumer education, the three which included a supervisory component reported a median improvement of 27% in prescribing indicators, while the seven that did not include supervision reported a median improvement of 11%.

Figure 10.10: Median reported percentage change across all prescribing outcomes for well-designed paediatric prescribing improvement interventions, by type of intervention



Key Points:

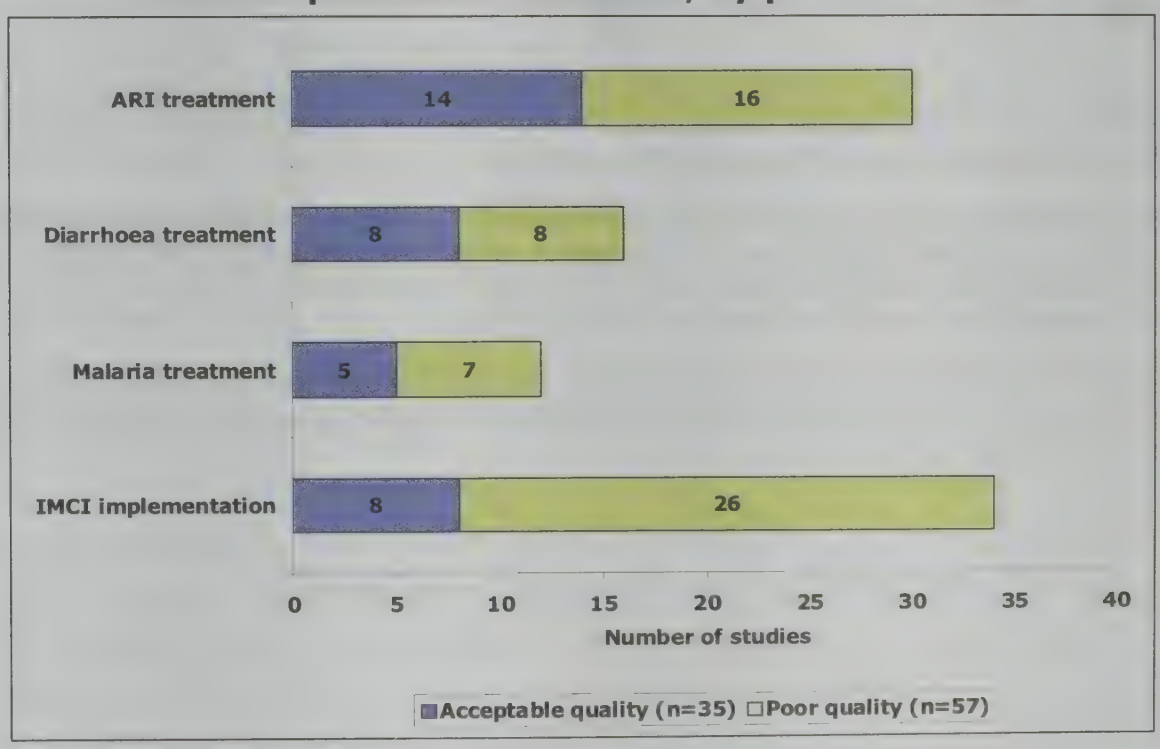
- The median reported effect size was a 16% improvement in study outcomes (25^{th}:75^{th} percentiles 7%:26%); this represents a 9% greater magnitude of change than that observed in the non-paediatric studies. Overall, 7 of the 36 studies reported a median change of 5% or less across all prescribing outcomes.
- There was a very large effect size in the single well-designed study (classified as an EMP intervention - see figures 10.5 and 10.6), which examined the effects of the implementation of the national IMCI programme in Bangladesh on a range of prescribing indicators. The poor quality of research on the impacts of these types of national policies makes it impossible to know whether this finding is at all generalizable.
- All types of educational interventions to improve paediatric prescribing (whether directed at providers alone, consumers alone, or both providers and consumers) had median effect sizes between 11% and 16%.
- Among the interventions that combined provider and consumer education, the four which included a supervisory component reported a median improvement of 18% in prescribing indicators, while the five that did not include supervision reported a median improvement of 6%.

10.4 Comparison of paediatric interventions targeting different conditions

In addition to differences in intervention design, paediatric interventions also vary by the health problem targeted. Earlier paediatric studies reported in the database tended to focus on improving treatment for one of three common health problems: acute respiratory infections, diarrhoea, or malaria. In recent years, paediatric interventions have tended to address all three of these common infections together in the context of implementing IMCI treatment approaches. We will consider these interventions targeting common paediatric infections together as a group.

Figure 10.11 presents the quality of the research designs for the paediatric interventions targeting common infections categorized in these four groups of intervention studies, while **Figure 10.12** compares the effects sizes observed for these interventions.

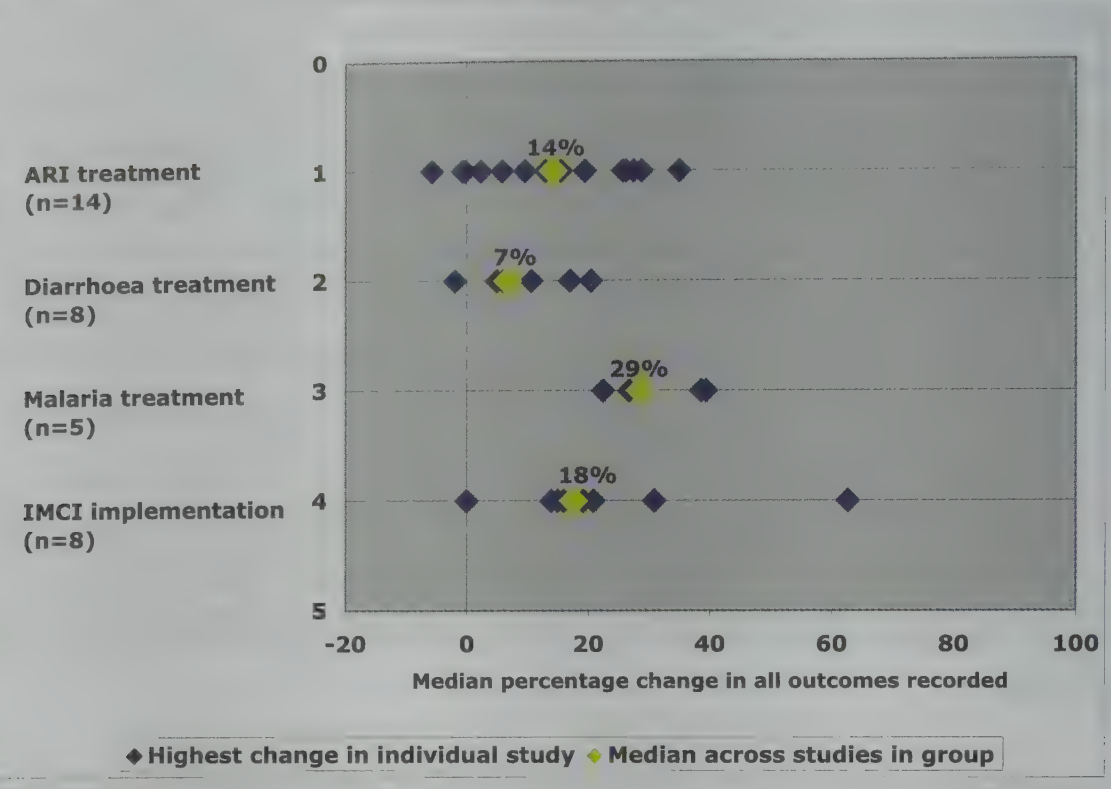
Figure 10.11: Methodological quality of prescribing improvement interventions targeting common paediatric infections, by problem focus



Key Points:

- There are four distinct clusters of well-designed paediatric studies in the database, those focused on improving prescribing and patient care for ARI, diarrhoea, and malaria, and a more recent group of studies assessing the impacts of the implementation of IMCI programmes.
- Although IMCI evaluations comprise the largest group of paediatric studies, only 24% of these 34 studies have adequate research designs.

Figure 10.12: Median reported percentage change in prescribing outcomes in well-designed paediatric prescribing improvement interventions targeting common infections, by problem focus



Key Points:

- The largest median improvement in prescribing outcomes (29%) was observed for studies focused on improving malaria treatment; all 5 of these studies had median improvements in study outcomes between 23% and 39%.
- Overall, well-designed ARI and IMCI studies resulted in similar median improvements in key prescribing outcomes of 14% and 18% respectively; however 4 of 14 ARI studies reported median improvements of less than 5% in the prescribing outcomes studied, while only 1 of 8 IMCI studies had a median improvement that low.
- The 8 studies focused on prescribing for paediatric diarrhoea reported the lowest median improvement in study outcomes of 7%, substantially lower than other types of studies targeting paediatric infections.

11. DISCUSSION AND RECOMMENDATIONS

This fact book summarizes the information contained in a database of existing published literature and unpublished reports related to medicines use. This database was created by WHO to monitor the use of medicines in primary care and to measure the impacts of interventions aimed at improving medicines use in developing and transitional countries. The analysis of existing published literature and unpublished reports provides an alternative to direct monitoring of medicines use, especially since many countries do not do so in any systematic way. This approach can focus on general medicines use and on the treatment of the most prevalent conditions in primary care, and it can evaluate the use of medicines over specific periods of time, in different regions, and by types of facility or prescriber. WHO undertook an analysis of the database on medicines use, and the results are presented in this Fact Book. The findings provide adequate information to draw several conclusions about the use of medicines in primary care in developing and transitional countries.

11.1 Major findings

The WHO database constitutes a large body of collected evidence about medicines use. It contains data collected in 97 countries over a period of 25 years, about 856 study populations. Because of long-standing support for work on medicines use by WHO and donor organizations, the majority of data come from public health-care facilities. The number of studies conducted in pharmacy shops and in non-licensed shops was very small, only 13 and 2% respectively, and the number of studies investigating prescribing practices of pharmacy assistants and pharmacists was only 3%, precluding analyses of these types of facilities and prescribers.

In general, the results are similar in all geographic regions and time periods, and suggest that prescribing patterns have not improved in any systematic way over time. During the most recent period of data collection, fewer than half of patients were treated according to clinical guidelines for the common diseases seen in primary care settings. The use of antibiotics has increased over time to reach 50% of prescriptions in primary care studies with both percentages of antibiotics prescribed inappropriately and in underdosage increasing to over half of antibiotic prescriptions. Studies in acute respiratory tract infection and malaria suggest that medicines use in these conditions may have deteriorated somewhat over time. Over two-third of all cases of upper respiratory tract infection received antibiotics unnecessarily, while less than 80% of pneumonia cases were treated with an appropriate antibiotic in most recent studies. During the same period, only half of malaria cases received appropriate antimalarials. On the other hand, some encouraging trends were observed with regards to the percentage of medicines prescribed from EML/formularies and the use of generics. In addition, the percentage of children receiving ORT for diarrhea doubled over time, although reaching only 60%; a substantial decrease was observed in the use of antidiarrhoeals.

Most studies report results from the public sector. Nevertheless, results suggest that the use of medicines in studies in public health-care facilities, while still deficient, was substantially better than in private facilities: this was true for WHO/INRUD prescribing indicators and also for ARI, diarrhoea and appropriate antibiotic use. These results may indicate a high proportion of clinically inefficient and ineffective care in settings where the private sector carries out the majority of primary care prescribing. In contrast, patient care indicators appeared to be better in studies from the private sector, where consultation and dispensing times were longer, labelling was more often adequate, and patient knowledge of dosing was also better. Prescribing by paramedical and nursing staff was similar to that of doctors when measured by the WHO/INRUD indicators, as well as specific indicators related to treatment of ARI, diarrhoea and to the inappropriate use of antibiotics. The poorer prescribing practices seen in the private sector may account in part for the overall deterioration of some prescribing practices, since an increasing proportion of health care is being provided by the private sector.

A total of 121 interventions adequately evaluated in 81 studies is a very small body of evidence for all developing and transitional countries over a period of 25 years. In addition to the small number of studies, the research topics and approaches are fragmented, and research studies are often designed and conducted without taking into account what is already known about the medicines use problem or about successful intervention approaches. Methods are not standardized, which limits the quality of studies as well as comparability. Many important topics remain virtually unexplored, such as the impact of interventions on cost of medicines or total cost of treatment.

In general, the levels and patterns of intervention impacts are similar to those reported in systematic reviews of intervention studies conducted in the industrialized world.[24,25] As has been found in a majority of systematic reviews of interventions in industrialized countries, interventions that involved several components appeared to have greater effects on clinical practice.[26,27] Interventions with multiple components that involved education for both health providers and consumers, provider group educational processes, and especially interventions involving enhanced supervision of prescribing practice appeared to be particularly promising. Given their widespread implementation, there is a need to conduct more rigorous longitudinal research of the effects of National Medicines Policies and Essential Medicines Programmes.

11.2 Remaining gaps in knowledge

While the database of medicines use surveys has provided much information about prescribing in the public primary care sector, much still remains unknown about the private sector. The quality of care provided by private practitioners including clinicians, pharmacists, pharmacy assistants and informal medicine sellers remain largely unknown.

No attempt was made to collect data on use of medicines in inpatient or specialty care, particularly for chronic disease; this remains a large gap in current knowledge that remains to be investigated. In addition, almost no data are available on cost-effectiveness of interventions to improve medicines use, and very few of the studies entered into the database had any costing data that could be used to estimate cost-effectiveness.

It is important to note that there are several important aspects of medicines use which are not yet abstracted into the database, including geographic and financial access to and affordability of medicines, safety of medicines use; health-seeking behaviour and self-medication practices; accuracy of diagnostic decision-making; and medicines use in hospital inpatient settings.

The proportion of policies and planned interventions targeting medicines use that are evaluated with methodologically adequate research designs is very low and the evidence base for recommending effective intervention approaches is growing slowly and haphazardly. National governments need to be more committed to well-designed research to evaluate the impacts of public pharmaceutical sector programmes, and there is a critical need to evaluate strategies to improve the use of medicines in the private sector.

11.3 Recommendations

11.3.1 Maintaining, updating, and disseminating the database

Information on access to medicines, affordability, and appropriateness of medicines use, and on the impacts of interventions designed to improve the medicines situation, is crucial for decision making at national and international levels. To develop strategies for improving the medicines situation for the most vulnerable populations, global and domestic policy makers need to know the status of medicines use, where gaps in knowledge exist, and which interventions are most likely to succeed.

At present, no process for systematically compiling and evaluating information on medicines use exists globally. Without such data, stakeholders will have difficulty grasping the severity of the problem of inappropriate use and will have little motivation to make investments to solve the problem. Ideally, a programme to monitor medicines use on a systematic basis should be established at the global level, with a mission to provide timely evidence for national policy-making.

The WHO database of studies on medicines use is currently the only tool available to monitor medicines use indicators over time in developing and transitional countries.

Despite the limitations of the current database and in the analyses presented in this report (discussed in detail in Chapter 2), we suggest the following:

- The medicines use database should be continuously updated with regular up-to-date analyses to monitor trends in use and intervention impacts. We expect that more data on medicines access, affordability, and use will become available in the near future, given the large-scale investments of the international donor community in recent years, and the focus of planned major international initiatives. A system to continuously update and disseminate results from the database requires dedicated resources. Compared to the billion dollar global investments to improve access to medicines for HIV/AIDS, TB, and malaria, maintaining the WHO database of studies in its current form would require a relatively minor budget covering portions of the effort of a small number of professional staff. Expansion of the database to cover available data on the additional areas of medicines use recommended below would require further investment.
- The continuously updated database and updated user-friendly summaries of its contents should be made publicly available on the Internet, with search engines that allow easy access to and use of the information for governments, civil society, and the international development community. WHO Collaborating Centres, international networks, and networks like INRUD should provide links to the WHO database on their websites. Resources will also need to be allocated to develop and maintain a user-friendly Internet-based platform for the database and to publish the summary reports and recommendations resulting from it.

11.3.2 Expanding the database content

- The database should gradually be expanded to include additional key aspects of medicines use. Important domains currently not represented include geographic access to, and household affordability of, medicines; safety of medicines use; health-seeking behaviour and self-medication practices; hospital inpatient and specialty medicines use; and patient adherence to treatment. Information on many of these topics will need to come from a variety of sources, including household surveys. Standardized indicators of these additional domains will need to be carefully defined in order to systematically capture them in an expanded database.
- Governments, academia, the private sector and international organizations should be encouraged to fill gaps in knowledge about medicines access, household affordability and use by conducting evaluations and monitoring situations in their settings.
- A major gap in knowledge exists on medicines use in the private sector. which provides most of the care in developing and transitional countries. National and international initiatives are urgently needed to fill this gap.
- A WHO-based registry of evaluation and monitoring studies on medicines access and use could facilitate the inclusion of results from studies into the WHO database.

- To improve the quality of interventions, information on design options and on statistical tools and approaches for analyses need to be disseminated to those who conduct evaluations and monitor programmes at country and international levels. Networks like the International Network for the Rational Use of Drugs (INRUD) and the newly created Access to Medicines (ATM) research network could develop Internet-based training programmes and sharing of tools for research focused on interventions to improve medicines use.

ANNEX 1: SUMMARY OF DATA INCLUDED IN FIGURES

Note: The medians of all groups with sample sizes of less than four studies are excluded from figures in the main text.

Figure 4.1: WHO/INRUD prescribing indicators, by time period

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Medicines from EML or Formulary				
1982-1991	6	66.0	40.0	86.0
1992-1994	23	83.7	68.0	94.4
1995-1997	38	73.6	55.3	88.1
1998-2000	50	71.2	45.7	88.1
2001-2003	36	90.2	78.7	96.0
2004-2006	9	89.4	82.5	92.5
% Medicines Prescribed by Generic Name				
1982-1991	11	44.0	16.0	80.0
1992-1994	43	59.0	42.8	72.0
1995-1997	44	49.0	33.6	74.6
1998-2000	53	55.0	15.4	76.0
2001-2003	27	60.0	48.6	84.0
2004-2006	14	72.3	27.0	83.7
% Patients with an Antibiotic Prescribed				
1982-1991	38	42.8	28.4	54.0
1992-1994	62	43.9	34.0	57.1
1995-1997	72	48.8	36.3	56.4
1998-2000	71	46.9	35.0	56.0
2001-2003	75	46.7	35.8	58.1
2004-2006	24	46.4	32.0	55.3
% Patients with Injection Prescribed				
1982-1991	28	23.7	13.6	48.0
1992-1994	51	20.0	11.5	34.9
1995-1997	61	20.0	11.1	28.0
1998-2000	58	20.6	9.1	31.0
2001-2003	52	21.9	8.1	34.1
2004-2006	18	19.0	7.6	37.1
% Treated According to Clinical Guidelines				
1982-1991	14	49.4	41.0	77.0
1992-1994	51	28.7	12.4	48.0
1995-1997	55	33.0	16.2	50.0
1998-2000	33	33.9	13.7	46.4
2001-2003	39	43.0	18.1	61.8
2004-2006	13	39.3	21.0	58.0
Average Number of Medicines per Patient				
1982-1991	38	2.0	1.4	2.4
1992-1994	78	2.5	2.0	3.4
1995-1997	85	2.4	2.0	3.0
1998-2000	86	2.6	2.1	3.2
2001-2003	66	2.7	2.2	3.4
2004-2006	17	2.5	2.2	2.8

Figure 4.2: WHO/INRUD prescribing indicators, by World Bank region				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Medicines from EML or Formulary				
Sub-Saharan Africa	67	87.8	69.0	94.0
Latin America and Caribbean	16	71.4	43.0	85.3
Middle East and Central Asia	13	79.4	46.7	95.0
East Asia and Pacific	26	71.7	46.5	85.8
South Asia	40	84.0	58.5	89.7
% Medicines Prescribed by Generic Name				
Sub-Saharan Africa	89	60.0	36.1	80.0
Latin America and Caribbean	14	67.3	52.0	74.0
Middle East and Central Asia	25	42.8	24.3	69.0
East Asia and Pacific	15	64.5	33.2	78.7
South Asia	49	44.0	15.4	69.8
% Patients with an Antibiotic Prescribed				
Sub-Saharan Africa	135	47.0	38.0	55.5
Latin America and Caribbean	28	39.3	30.9	65.6
Middle East and Central Asia	42	45.3	30.5	60.9
East Asia and Pacific	45	42.5	27.6	51.6
South Asia	92	49.1	37.2	57.0
% Patients with Injection Prescribed				
Sub-Saharan Africa	124	27.5	17.6	38.0
Latin America and Caribbean	14	13.2	10.5	24.0
Middle East and Central Asia	33	17.0	8.0	30.0
East Asia and Pacific	34	14.8	7.0	31.7
South Asia	63	11.5	5.1	22.0
% Treated According to Clinical Guidelines				
Sub-Saharan Africa	106	43.2	19.0	62.0
Latin America and Caribbean	28	39.3	21.5	52.2
Middle East and Central Asia	17	35.7	29.0	46.4
East Asia and Pacific	25	29.5	13.7	42.9
South Asia	29	28.7	12.5	41.0
Average Number of Medicines per Patient				
Sub-Saharan Africa	145	2.6	2.1	3.2
Latin America and Caribbean	32	1.8	1.3	2.3
Middle East and Central Asia	51	2.6	2.1	3.2
East Asia and Pacific	47	3.0	2.4	3.7
South Asia	95	2.5	2.1	2.9

Figure 4.3: WHO/INRUD prescribing indicators, by World Bank income level				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Medicines from EML or Formulary				
Low Income	103	86.0	67.0	93.9
Lower-Middle Income	38	75.1	56.0	91.2
Upper-Middle & High Income	21	43.9	38.5	79.4
% Medicines Prescribed by Generic Name				
Low Income	130	60.8	36.0	78.0
Lower-Middle Income	37	57.0	24.3	71.6
Upper-Middle & High Income	25	36.0	12.5	57.5
% Patients with an Antibiotic Prescribed				
Low Income	224	48.7	37.7	57.1
Lower-Middle Income	72	42.8	34.5	53.5
Upper-Middle & High Income	46	38.2	25.5	55.0
% Patients with Injection Prescribed				
Low Income	186	23.2	13.0	37.1
Lower-Middle Income	54	15.0	8.5	30.0
Upper-Middle & High Income	28	11.0	7.7	24.1
% Treated According to Clinical Guidelines				
Low Income	134	35.0	17.0	58.0
Lower-Middle Income	49	35.0	15.0	45.0
Upper-Middle & High Income	22	42.3	31.0	65.2
Average Number of Medicines per Patient				
Low Income	233	2.5	2.0	3.2
Lower-Middle Income	80	2.6	2.2	3.3
Upper-Middle & High Income	57	2.3	1.8	2.6

Figure 4.4: Rates of adherence to clinical guidelines over time, by World Bank region					
Indicator and category	**Period**	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Treated According to Clinical Guidelines					
Sub-Saharan Africa	1982-1994	29	46.3	21.0	78.3
	1995-2000	48	27.4	11.5	57.2
	2001-2006	29	48.1	23.2	62.0
Latin America and Caribbean	1982-1994	13	32.2	22.0	44.0
	1995-2000	10	47.5	35.0	61.0
	2001-2006	5	39.3	14.7	51.4
Middle East and Central Asia	1982-1994	4	29.9	3.5	55.8
	1995-2000	8	32.5	23.0	44.7
	2001-2006	5	38.9	35.6	40.5
East Asia and Pacific	1982-1994	7	25.0	12.4	45.0
	1995-2000	11	29.5	5.0	38.2
	2001-2006	7	36.3	15.4	58.0
South Asia	1982-1994	12	28.6	13.4	39.4
	1995-2000	11	33.3	23.1	49.0
	2001-2006	6	14.3	2.6	51.6

Figure 4.5: WHO/INRUD prescribing indicators by prescriber type				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Medicines from EML or Formulary				
MD	63	73.0	47.0	90.8
Paramedic or Nurse	86	87.4	68.0	94.0
Pharmacy Staff, Other, or Unspecified	20	64.5	44.0	83.0
% Medicines Prescribed by Generic Name				
MD	84	37.9	15.4	68.0
Paramedic or Nurse	100	64.4	49.3	80.8
Pharmacy Staff, Other, or Unspecified	15	48.0	36.0	71.6
% Patients with an Antibiotic Prescribed				
MD	134	48.6	30.6	62.3
Paramedic or Nurse	175	48.0	38.0	55.0
Pharmacy Staff, Other, or Unspecified	45	37.0	19.7	46.7
% Patients with Injection Prescribed				
MD	90	17.3	7.8	34.9
Paramedic or Nurse	161	21.9	11.0	34.1
Pharmacy Staff, Other, or Unspecified	31	23.0	11.0	30.0
% Treated According to Clinical Guidelines				
MD	42	37.2	19.5	51.6
Paramedic or Nurse	135	39.2	21.0	59.3
Pharmacy Staff, Other, or Unspecified	29	13.5	3.0	42.8
Average Number of Drugs per Patient				
MD	158	2.6	2.2	3.2
Paramedic or Nurse	180	2.4	2.0	3.2
Pharmacy Staff, Other, or Unspecified	45	2.2	1.4	2.8

Figure 4.6: WHOINRUD prescribing indicators by health facility ownership (prescribing by physicians, nurses, paramedics)				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Medicines from EML or Formulary				
Public	104	88.0	74.3	94.0
Private, for profit	19	52.6	38.0	67.0
Private, not for profit	8	77.0	58.9	84.0
% Medicines Prescribed by Generic Name				
Public	131	60.6	36.1	80.0
Private, for profit	24	13.3	7.8	50.4
Private, not for profit	10	62.5	52.0	75.5
% Patients with an Antibiotic Prescribed				
Public	223	48.4	37.0	57.1
Private, for profit	39	47.5	32.0	58.0
Private, not for profit	14	45.9	34.0	70.8
% Patients with Injection Prescribed				
Public	173	20.0	10.0	32.7
Private, for profit	34	19.4	7.0	38.0
Private, not for profit	11	37.0	19.0	63.1
% Treated According to Clinical Guidelines				
Public	146	39.3	21.5	59.0
Private, for profit	12	27.5	14.0	37.5
Private, not for profit	2	14.7	11.3	18.1
Average Number of Medicines per Patient				
Public	236	2.4	2.0	2.9
Private, for profit	51	3.0	2.4	3.7
Private, not for profit	14	3.0	2.4	3.3

Figure 5.1: WHO/INRUD patient care indicators, by time period				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Prescribed Medicines Dispensed				
1982-1991	7	81.0	57.5	83.3
1992-1994	17	84.5	77.2	90.0
1995-1997	24	81.2	65.8	88.3
1998-2000	32	81.7	70.3	90.0
2001-2003	38	87.0	76.9	98.0
2004-2006	10	92.4	85.5	97.1
% Medicines Adequately Labeled				
1982-1991	1	44.0	44.0	44.0
1992-1994	11	49.0	12.0	82.0
1995-1997	17	44.0	19.0	59.5
1998-2000	15	49.4	1.1	91.4
2001-2003	30	47.6	5.0	82.6
2004-2006	10	79.0	64.6	100.0
% Patients Given Dosage Instructions				
1982-1991	3	10.0	0.0	15.0
1992-1994	21	53.0	26.0	64.0
1995-1997	28	45.1	26.5	64.5
1998-2000	19	41.0	20.0	60.0
2001-2003	25	47.0	37.0	74.0
2004-2006	7	57.3	49.0	85.0
% Patients with Knowledge of Correct Dose				
1982-1991	5	55.0	27.0	56.0
1992-1994	34	57.5	35.0	77.0
1995-1997	34	67.5	50.0	77.0
1998-2000	29	58.0	46.0	65.0
2001-2003	58	68.8	54.4	80.4
2004-2006	20	72.5	56.5	80.8
Average Consultation Time (minutes)				
1982-1991	4	2.8	1.7	3.3
1992-1994	22	3.9	2.9	6.3
1995-1997	19	5.5	4.0	6.0
1998-2000	13	4.3	3.6	6.7
2001-2003	11	4.8	3.5	7.8
2004-2006	5	5.6	4.5	6.2
Average Dispensing Time (seconds)				
1982-1991	3	86.0	23.0	178.0
1992-1994	15	77.8	14.0	125.0
1995-1997	14	90.4	30.1	130.0
1998-2000	9	47.2	31.0	123.0
2001-2003	6	79.0	25.4	149.0
2004-2006	3	71.3	46.3	176.0

Figure 5.2: WHO/INRUD patient care indicators, by World Bank region				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Prescribed Medicines Dispensed				
Sub-Saharan Africa	60	86.0	76.9	90.0
Latin America and Caribbean	13	69.4	65.5	84.3
Middle East and Central Asia	11	96.8	81.8	98.0
East Asia and Pacific	14	100.0	87.0	100.0
South Asia	30	80.8	70.2	88.0
% Medicines Adequately Labeled				
Sub-Saharan Africa	34	49.3	20.2	69.5
Latin America and Caribbean	5	49.0	24.0	74.5
Middle East and Central Asia	9	84.0	65.2	100.0
East Asia and Pacific	16	68.5	51.1	99.5
South Asia	20	1.1	0.0	28.5
% Patients Given Dosage Instructions				
Sub-Saharan Africa	49	46.0	32.0	60.2
Latin America and Caribbean	16	36.5	22.3	71.2
Middle East and Central Asia	10	53.5	24.0	61.0
East Asia and Pacific	18	53.5	40.6	67.0
South Asia	10	44.0	31.1	82.0
% Patients with Knowledge of Correct Dose				
Sub-Saharan Africa	78	68.5	46.0	80.0
Latin America and Caribbean	21	64.0	55.0	88.5
Middle East and Central Asia	18	63.1	60.0	79.2
East Asia and Pacific	29	74.0	50.0	82.0
South Asia	34	56.1	47.6	66.0
Average Consultation Time (minutes)				
Sub-Saharan Africa	33	5.1	3.8	6.1
Latin America and Caribbean	5	10.0	6.7	14.0
Middle East and Central Asia	7	3.9	3.8	5.6
East Asia and Pacific	7	4.4	3.0	7.4
South Asia	22	3.5	2.0	4.8
Average Dispensing Time (seconds)				
Sub-Saharan Africa	25	84.0	37.0	132.0
Latin America and Caribbean	1	17.0	17.0	17.0
Middle East and Central Asia	5	30.1	29.7	102.0
East Asia and Pacific	7	36.5	8.0	129.5
South Asia	12	82.3	37.5	136.0

Figure 5.3: WHO/INRUD patient care indicators, by World Bank income level				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Prescribed Medicines Dispensed				
Low Income	86	83.3	73.0	89.9
Lower-Middle Income	26	86.4	71.1	95.6
Upper-Middle & High Income	16	88.3	68.4	97.5
% Patients Given Dosage Instructions				
Low Income	66	46.4	32.0	60.0
Lower-Middle Income	29	48.0	25.0	68.0
Upper-Middle & High Income	8	69.5	19.8	74.5
% Patients with Knowledge of Correct Dose				
Low Income	112	61.4	47.3	76.3
Lower-Middle Income	45	73.7	50.0	86.6
Upper-Middle & High Income	23	66.0	61.4	80.0
Average Consultation Time (minutes)				
Low Income	55	4.4	2.9	6.0
Lower-Middle Income	11	5.6	3.9	7.8
Upper-Middle & High Income	8	5.6	4.0	8.3
Average Dispensing Time (seconds)				
Low Income	36	81.3	34.0	140.5
Lower-Middle Income	9	51.0	28.8	129.5
Upper-Middle & High Income	5	29.7	17.0	30.1

Figure 5.4: WHO/INRUD patient care indicators, by health facility ownership				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Prescribed Medicines Dispensed				
Public	103	85.0	73.0	94.0
Private, for profit	13	75.8	72.5	85.0
Private, not for profit	7	94.3	88.0	98.0
% Medicines Adequately Labeled				
Public	69	48.0	7.0	84.0
Private, for profit	6	61.4	49.4	82.0
Private, not for profit	6	56.1	6.7	87.6
% Patients Given Dosage Instructions				
Public	86	47.5	29.0	68.0
Private, for profit	10	45.8	40.6	60.0
Private, not for profit	0	.	.	.
% Patients with Knowledge of Correct Dose				
Public	159	62.8	47.6	78.0
Private, for profit	6	83.5	76.0	94.0
Private, not for profit	6	87.8	84.9	92.0
Average Consultation Time (minutes)				
Public	51	4.3	2.9	6.3
Private, for profit	10	6.4	5.0	8.7
Private, not for profit	6	5.2	3.7	6.1
Average Dispensing Time (seconds)				
Public	36	77.9	29.3	127.3
Private, for profit	4	82.5	43.8	171.0
Private, not for profit	5	39.9	18.1	186.0

Figure 5.5: WHO/INRUD health facility indicators, by time period				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Key Medicines Available in Facility				
1982-1991	8	68.5	55.6	76.0
1992-1994	26	76.5	70.0	85.7
1995-1997	24	81.5	59.9	90.5
1998-2000	34	70.0	58.0	84.6
2001-2003	68	80.0	68.5	89.5
2004-2006	22	82.5	80.0	89.0
Availability of Clinical Guidelines				
1982-1991	0	.	.	.
1992-1994	9	65.8	38.0	71.9
1995-1997	11	61.0	22.2	77.0
1998-2000	14	47.0	9.0	61.0
2001-2003	37	66.5	34.0	91.0
2004-2006	15	51.0	40.0	75.0
Availability of EML or Formulary				
1982-1991	1	16.0	16.0	16.0
1992-1994	9	80.0	17.5	87.5
1995-1997	8	60.5	30.6	77.5
1998-2000	10	34.8	7.7	81.0
2001-2003	26	42.7	10.0	90.0
2004-2006	7	67.0	37.0	85.0

Figure 5.6: WHO/INRUD health facility indicators, by World Bank region				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Key Medicines Available in Facility				
Sub-Saharan Africa	85	81.5	70.0	89.0
Latin America and Caribbean	29	66.9	57.1	79.5
Middle East and Central Asia	11	91.5	55.2	97.0
East Asia and Pacific	26	80.0	64.0	86.7
South Asia	31	81.1	69.9	88.1
Availability of Clinical Guidelines				
Sub-Saharan Africa	46	55.3	34.0	79.5
Latin America and Caribbean	13	46.0	17.4	70.0
Middle East and Central Asia	8	84.0	3.5	93.0
East Asia and Pacific	15	70.0	49.0	94.0
South Asia	4	26.7	1.2	51.5
Availability of EML or Formulary				
Sub-Saharan Africa	28	51.5	17.3	82.9
Latin America and Caribbean	10	58.5	39.3	87.5
Middle East and Central Asia	6	59.5	44.0	96.0
East Asia and Pacific	8	80.0	36.3	100.0
South Asia	9	4.8	0.0	16.0

Figure 5.7: WHO/INRUD health facility indicators, by World Bank income level				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Key Medicines Available in Facility				
Low Income	118	80.0	68.4	86.7
Lower-Middle Income	43	79.5	60.0	91.0
Upper-Middle & High Income	21	83.0	58.0	93.3
Availability of Clinical Guidelines				
Low Income	48	50.5	25.0	71.0
Lower-Middle Income	29	65.8	39.3	85.0
Upper-Middle & High Income	9	83.0	62.0	96.0
Availability of EML or Formulary				
Low Income	39	45.0	10.0	85.0
Lower-Middle Income	16	50.5	22.9	84.5
Upper-Middle & High Income	6	64.5	59.0	96.0

Figure 5.8: WHO/INRUD health facility indicators, by facility ownership				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% of Key Medicines Available in Facility				
Public	135	80.0	64.9	86.7
Private, for profit	33	80.0	69.4	86.7
Private, not for profit	8	88.8	64.2	91.4
Availability of Clinical Guidelines				
Public	78	60.5	38.0	83.0
Private, for profit	4	5.7	2.9	16.5
Private, not for profit	2	19.2	17.4	21.0
Availability of EML/Formulary				
Public	52	51.5	10.6	88.2
Private, for profit	3	41.4	11.9	63.0
Private, not for profit	3	57.0	8.7	100.0

Figure 6.1: ARI prescribing indicators over time, including all studies of medicine use in ARI

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
1982-1991	11	43.4	26.0	76.0
1992-1994	18	54.2	31.0	83.0
1995-1997	26	40.4	25.0	66.0
1998-2000	24	50.9	24.2	71.1
2001-2003	35	68.8	52.0	85.2
2004-2006	12	70.5	48.0	83.5
% Pneumonia Cases Treated with Recommended Antibiotics				
1982-1991	5	80.0	66.7	80.0
1992-1994	15	69.0	42.2	82.5
1995-1997	16	60.5	46.5	78.0
1998-2000	25	58.1	42.0	79.0
2001-2003	39	53.7	28.0	75.0
2004-2006	16	76.5	45.5	92.2
% Treated According to Clinical Guidelines				
1982-1991	3	52.7	41.0	58.8
1992-1994	8	42.1	29.0	58.2
1995-1997	11	38.2	29.0	43.3
1998-2000	13	35.0	25.2	50.0
2001-2003	22	43.0	18.1	62.0
2004-2006	8	34.9	22.0	51.5
% ARI Cases Treated with Cough Syrups				
1982-1991	7	54.0	24.8	96.4
1992-1994	4	37.9	23.8	51.2
1995-1997	6	61.2	45.0	63.0
1998-2000	7	49.9	16.5	61.5
2001-2003	12	34.3	12.8	46.5
2004-2006	0	.	.	.

Figure 6.2: ARI treatment indicators over time, including only studies of medicine use in children < 5 years with ARI

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
1982-1991	8	42.9	28.0	75.0
1992-1994	14	36.9	18.0	70.0
1995-1997	23	39.6	24.0	65.0
1998-2000	16	42.5	21.5	61.0
2001-2003	12	58.7	29.0	74.9
2004-2006	5	71.0	65.1	71.5
% Pneumonia Cases Treated with Recommended Antibiotics				
1982-1991	5	80.0	66.7	80.0
1992-1994	15	69.0	42.2	82.5
1995-1997	15	63.0	50.0	81.0
1998-2000	22	55.4	40.0	66.0
2001-2003	29	50.0	25.3	73.0
2004-2006	10	64.5	27.0	77.0
% Treated According to Clinical Guidelines				
1982-1991	2	55.8	52.7	58.8
1992-1994	8	42.1	29.0	58.2
1995-1997	8	38.7	29.6	43.2
1998-2000	11	35.0	25.2	53.0
2001-2003	19	51.4	18.1	71.0
2004-2006	8	34.9	22.0	51.5
% ARI Cases Treated with Cough Syrups				
1982-1991	4	60.6	24.1	97.6
1992-1994	3	34.5	13.0	41.2
1995-1997	4	62.7	53.7	81.5
1998-2000	3	51.0	49.9	86.6
2001-2003	5	10.0	6.2	30.0
2004-2006	0	.	.	.

Figure 6.3: ARI treatment indicators including all studies of medicine use in ARI, by World Bank region

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
Sub-Saharan Africa	36	73.0	51.1	89.8
Latin America and Caribbean	20	54.7	21.2	73.9
Middle East and Central Asia	24	58.8	41.5	69.5
East Asia and Pacific	35	39.8	25.0	65.0
South Asia	11	53.0	18.0	75.7
% Pneumonia Cases Treated with Recommended Antibiotics				
Sub-Saharan Africa	50	58.5	34.0	78.0
Latin America and Caribbean	21	70.0	45.0	87.5
Middle East and Central Asia	17	66.7	58.1	75.0
East Asia and Pacific	16	74.3	64.5	91.0
South Asia	12	33.8	11.9	61.0
% Treated According to Clinical Guidelines				
Sub-Saharan Africa	27	43.0	22.5	60.0
Latin America and Caribbean	11	51.4	39.2	66.0
Middle East and Central Asia	8	40.9	29.2	55.8
East Asia and Pacific	12	35.1	18.3	43.1
South Asia	7	16.0	11.1	41.0
% ARI Cases Treated with Cough Syrups				
Sub-Saharan Africa	11	34.5	15.6	49.9
Latin America and Caribbean	4	51.5	41.5	63.8
Middle East and Central Asia	6	58.2	45.0	96.4
East Asia and Pacific	8	53.4	28.9	63.5
South Asia	7	26.4	13.0	51.0

Figure 6.4: ARI treatment indicators including all studies of medicine use in ARI, by World Bank income level

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
Low Income	59	63	31	81.2
Low Middle Income	44	54.65	25.51	65.28
Upper Middle & High Income	23	59	27.7	80.3
% Pneumonia Cases Treated with Recommended Antibiotics				
Low Income	65	52.85	27	76
Low Middle Income	32	73.8	59.15	81.65
Upper Middle & High Income	19	75	58.12	89
% Treated According to Clinical Guidelines				
Low Income		34.9	18.12	46.3
Low Middle Income	19	42.9	29.9	58.8
Upper Middle & High Income	9	62	51.4	67.5
% ARI Cases Treated with Cough Syrups				
Low Income	19	30	15.6	47.8
Low Middle Income	9	62.3	40	63.97
Upper Middle & High Income	8	60.6	49.5	64.5

Figure 6.5: ARI treatment indicators including all studies of medicine use in ARI, by type of prescriber

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
MD	39	67.9	42.4	82.4
Paramedic or Nurse	62	59.0	29.0	77.0
Pharmacy Staff, Other, or Unspecified	26	47.7	26.0	62.0
% Pneumonia Cases Treated with Recommended Antibiotics				
MD	19	72.0	53.3	83.0
Paramedic or Nurse	86	63.0	42.1	78.4
Pharmacy Staff, Other, or Unspecified	12	44.0	21.8	71.4
% Treated According to Clinical Guidelines				
MD	12	45.1	35.1	63.2
Paramedic or Nurse	51	39.3	22.9	57.0
Pharmacy Staff, Other, or Unspecified	2	8.3	3.0	13.7
% ARI Cases Treated with Cough Syrups				
MD	17	45.2	35.6	64.0
Paramedic or Nurse	10	33.7	22.8	62.3
Pharmacy Staff, Other, or Unspecified	9	40.0	24.8	49.9

Figure 6.6: ARI treatment indicators for all studies of medicine use in ARI, by health care facility ownership (prescribing by physicians, nurses, paramedics)

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
Public	86	58.8	29.9	76.9
Private, for profit	10	76.6	68.8	83.0
Private, not for profit	0	.	.	.
% Pneumonia Cases Treated with Recommended Antibiotics				
Public	95	66.0	43.0	81.0
Private, for profit	6	67.4	49.7	91.5
Private, not for profit	0	.	.	.
% Treated According to Clinical Guidelines				
Public	58	39.3	27.8	58.0
Private, for profit	2	37.9	23.0	52.7
Private, not for profit	1	18.1	18.1	18.1
% ARI Cases Treated with Cough Syrups				
Public	16	45.1	27.9	62.7
Private, for profit	5	41.2	13.0	80.4
Private, not for profit	2	19.1	8.2	30.0

Figure 6.7: Percentage of key medicines available in health facilities for ARI treatment, by World Bank region

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Key Medicines Available in Facility				
Sub-Saharan Africa	24	76.1	64.5	83.0
Latin America and Caribbean	9	60.7	58.0	62.8
Middle East and Central Asia	2	62.5	28.0	97.0
East Asia and Pacific	3	86.0	80.0	89.0
South Asia	4	62.0	44.2	70.0

Figure 7.1: Diarrhoea treatment indicators over time, including all studies of medicine use in acute diarrhoea

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
1982-1991	24	47.9	29.7	79.3
1992-1994	36	38.5	19.6	56.2
1995-1997	23	33.3	11.0	50.5
1998-2000	13	35.7	19.5	50.0
2001-2003	27	62.0	44.4	73.1
2004-2006	11	46.0	24.3	60.0
% Diarrhoea Cases Treated with Antidiarrhoeals				
1982-1991	14	20.2	18.0	51.0
1992-1994	26	17.0	10.0	46.2
1995-1997	13	14.0	0.0	25.0
1998-2000	10	8.7	0.8	36.4
2001-2003	21	10.0	5.0	25.7
2004-2006	7	5.0	0.0	20.1
% Diarrhoea Cases Treated with ORT				
1982-1991	27	35.0	13.9	60.0
1992-1994	38	52.9	30.1	80.0
1995-1997	24	45.6	29.5	61.0
1998-2000	21	43.0	20.0	78.1
2001-2003	36	52.0	36.7	74.9
2004-2006	13	77.5	60.0	80.6
% Treated According to Clinical Guidelines				
1982-1991	2	36.6	32.2	41.0
1992-1994	31	25.0	8.3	46.3
1995-1997	15	24.0	7.6	47.0
1998-2000	10	39.5	27.8	53.0
2001-2003	13	42.9	17.1	60.5
2004-2006	7	39.3	21.0	57.0

Figure 7.2: Diarrhoea treatment indicators over time, including only studies of medicine use in children <5 years with acute diarrhoea

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
1982-1991	16	53.8	29.7	84.8
1992-1994	28	27.5	18.6	52.3
1995-1997	18	22.0	10.0	48.0
1998-2000	9	34.3	19.0	50.0
2001-2003	9	56.5	26.0	66.0
2004-2006	4	41.5	19.8	60.6
% Diarrhoea Cases Treated with Antidiarrhoeals				
1982-1991	11	20.0	17.5	51.0
1992-1994	20	15.0	9.7	35.8
1995-1997	9	5.0	0.0	17.3
1998-2000	6	17.7	1.0	36.4
2001-2003	7	10.0	4.5	32.0
% Diarrhoea Cases Treated with ORT				
1982-1991	21	27.6	13.6	60.0
1992-1994	29	52.8	32.0	81.4
1995-1997	16	48.5	22.3	61.5
1998-2000	15	23.1	10.0	62.0
2001-2003	19	50.0	20.0	60.0
2004-2006	6	69.5	40.0	80.6
% Treated According to Clinical Guidelines				
1982-1991	0	.	.	.
1992-1994	29	25.0	13.0	46.2
1995-1997	13	20.0	7.6	35.7
1998-2000	9	44.0	27.8	53.0
2001-2003	13	42.9	17.1	60.5
2004-2006	7	39.3	21.0	57.0

Figure 7.3: Diarrhoea treatment indicators including all studies of medicine use for acute diarrhoea, by World Bank region

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
Sub-Saharan Africa	45	42.0	20.2	63.0
Latin America and Caribbean	30	40.0	21.7	57.5
Middle East and Central Asia	9	22.0	8.0	31.0
East Asia and Pacific	22	55.9	46.0	81.3
South Asia	28	50.7	30.8	75.5
% Diarrhoea Cases Treated with Antidiarrhoeals				
Sub-Saharan Africa	36	10.0	3.7	36.0
Latin America and Caribbean	17	17.5	9.5	26.3
Middle East and Central Asia	6	15.0	6.5	19.0
East Asia and Pacific	18	16.6	10.0	27.7
South Asia	14	19.8	10.0	38.6
% Diarrhoea Cases Treated with ORT				
Sub-Saharan Africa	64	55.0	30.1	77.8
Latin America and Caribbean	25	43.0	10.0	60.0
Middle East and Central Asia	10	42.9	13.6	57.0
East Asia and Pacific	27	60.0	29.4	77.0
South Asia	33	53.1	30.4	80.0
% Treated According to Clinical Guidelines				
Sub-Saharan Africa	32	43.5	19.5	57.5
Latin America and Caribbean	17	39.3	23.0	53.0
Middle East and Central Asia	8	26.4	9.0	42.9
East Asia and Pacific	11	25.0	15.0	42.9
South Asia	10	14.8	8.3	33.0

Figure 7.4: Diarrhoea treatment indicators including all studies of medicine use for acute diarrhoea, by World Bank income level

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
Low Income	77	49.0	23.0	65.5
Lower-Middle Income	40	50.0	24.5	69.7
Upper-Middle & High Income	17	24.3	19.5	37.0
% Diarrhoea Cases Treated with Antidiarrhoeals				
Low Income	50	10.0	2.8	37.0
Lower-Middle Income	32	19.0	14.4	33.1
Upper-Middle & High Income	9	12.7	9.5	15.4
% Diarrhoea Cases Treated with ORT				
Low Income	100	52.8	28.4	77.5
Lower-Middle Income	40	45.0	16.8	63.5
Upper-Middle & High Income	19	52.8	29.4	90.0
% Treated According to Clinical Guidelines				
Low Income	43	35.0	17.0	51.0
Lower-Middle Income	22	26.0	15.0	44.0
Upper-Middle & High Income	13	37.0	23.0	65.2

Figure 7.5: Diarrhoea treatment indicators including all studies of medicine use for acute diarrhoea, by prescriber type

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
MD	34	60.0	37.0	82.3
Paramedic or Nurse	69	44.0	19.0	62.0
Pharmacy Staff, Other, or Unspecified	33	35.4	23.0	53.0
% Diarrhoea Cases Treated with Antidiarrhoeals				
MD	24	18.2	10.5	22.5
Paramedic or Nurse	43	7.4	1.0	25.7
Pharmacy Staff, Other, or Unspecified	27	32.0	19.1	57.0
% Diarrhoea Cases Treated with ORT				
MD	33	56.0	44.0	80.0
Paramedic or Nurse	77	63.0	44.8	80.0
Pharmacy Staff, Other, or Unspecified	52	21.5	12.1	45.4
% Treated According to Clinical Guidelines				
MD	14	25.0	15.0	44.2
Paramedic or Nurse	61	37.0	17.0	51.0
Pharmacy Staff, Other, or Unspecified	3	25.0	1.7	29.5

Figure 7.6: Diarrhoea treatment indicators for all studies of medicine use for acute diarrhoea, by health facility ownership (prescribing by physicians, nurses, paramedics)

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
Public	87	49.0	20.2	64.0
Private, for profit	9	73.1	64.3	96.0
Private, not for profit	0	.	.	.
% Diarrhoea Cases Treated with Antidiarrhoeals				
Public	54	10.0	4.7	19.0
Private, for profit	5	38.6	25.0	45.0
Private, not for profit	0	.	.	.
% Diarrhoea Cases Treated with ORT				
Public	90	62.5	45.1	81.4
Private, for profit	10	40.7	33.3	57.0
Private, not for profit	0	.	.	.
% Treated According to Clinical Guidelines				
Public	70	34.0	15.0	50.0
Private, for profit	2	23.0	23.0	23.0
Private, not for profit	0	.	.	.

Figure 7.7: Percentage of key medicines available in health facilities for diarrhoea treatment, by World Bank region

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Key Medicines Available in Facility				
Sub-Saharan Africa	21	76.0	65.0	82.0
Latin America and Caribbean	7	58.0	55.0	61.0
Middle East and Central Asia	2	62.5	28.0	97.0
East Asia and Pacific	2	84.5	80.0	89.0
South Asia	4	62.0	44.2	70.0

Figure 8.1: Prescribing of recommended antimalarial treatment over time, including all studies of antimalarial use

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Malaria Cases Treated with Recommended Antimalarials (All Ages)				
1982-1991	4	72.2	57.7	90.4
1992-1994	6	70.6	56.0	90.6
1995-1997	5	47.0	21.5	68.0
1998-2000	21	60.6	27.0	75.0
2001-2003	27	56.5	18.7	71.0
2004-2006	9	51.0	37.0	68.0

Figure 8.2: Prescribing of recommended antimalarial treatment over time, comparing studies that included only children <5 with all other studies

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Malaria Cases Treated with Recommended Antimalarials (Children < 5 Years)				
1982-1994	4	70.0	55.0	89.5
1995-2000	23	47.0	21.5	74.8
2001-2006	29	56.5	29.0	69.2
% Malaria Cases Treated with Recommended Antimalarials (Adults)				
1982-1994	6	72.2	57.2	90.6
1995-2000	3	71.5	60.6	89.9
2001-2006	7	55.0	16.0	94.9

Figure 9.1: Inappropriate prescribing of antibiotics over time

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Antibiotics Prescribed in Underdosage				
1982-1994	6	66.0	40.0	72.0
1995-2000	14	54.7	38.5	73.0
2001-2006	8	54.9	31.1	66.0
% Patients Prescribed Antibiotics Inappropriately				
1982-1994	97	42.0	21.0	70.0
1995-2000	103	39.6	21.0	61.9
2001-2006	121	55.4	27.7	72.9

Figure 9.2: Inappropriate prescribing of antibiotics, by World Bank region

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Antibiotics Prescribed in Underdosage				
Sub-Saharan Africa	11	54.8	38.5	73.0
Latin America and Caribbean	4	67.0	60.5	76.8
Middle East and Central Asia	3	29.7	22.0	67.0
East Asia and Pacific	4	61.4	51.4	80.0
South Asia	6	38.1	22.8	55.0
% Patients Prescribed Antibiotics Inappropriately				
Sub-Saharan Africa	104	47.3	21.5	71.5
Latin America and Caribbean	67	37.0	19.0	59.0
Middle East and Central Asia	39	43.7	22.0	65.1
East Asia and Pacific	64	49.8	32.0	68.1
South Asia	47	52.8	29.0	73.1

Figure 9.3: Inappropriate prescribing of antibiotics, by World Bank income level

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Antibiotics Prescribed in Underdosage				
Low Income	20	53.7	37.4	71.5
Lower-Middle Income	3	81.7	59.0	90.0
Upper-Middle & High Income	5	62.0	29.7	67.0
% Patients Prescribed Antibiotics Inappropriately				
Low Income	166	49.3	25.0	70.3
Lower-Middle Income	98	47.0	24.0	65.1
Upper-Middle & High Income	57	36.8	19.5	64.9

Figure 9.4: Inappropriate prescribing of antibiotics, by type of prescriber

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Antibiotics Prescribed in Underdosage				
MD	10	55.9	29.7	62.0
Paramedic or Nurse	12	45.6	29.3	62.5
Pharmacy Staff, Other, or Unspecified	8	72.5	50.0	90.0
% Patients Prescribed Antibiotics Inappropriately				
MD	91	59.3	36.8	79.0
Paramedic or Nurse	174	41.4	20.0	65.2
Pharmacy Staff, Other, or Unspecified	60	40.5	23.7	56.3

Figure 9.5: Inappropriate prescribing of antibiotics, by health care facility ownership (prescribing by physicians, nurses, paramedics)				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Patients Prescribed Antibiotics Inappropriately				
Public	228	44.7	22.0	66.2
Private, for profit	22	72.4	64.3	83.0
Private, not for profit	0	.	.	.
% Antibiotics Prescribed in Underdosage				
Public	13	52.7	26.0	59.0
Private, for profit	6	55.9	30.0	73.0
Private, not for profit	0	.	.	.

Annex Figure 2.1: WHO/INRUD prescribing indicators by WHO region				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Medicines from EML or Formulary				
Africa	67	87.8	69.0	94.0
Americas	16	71.4	43.0	85.3
Eastern Mediterranean	13	82.5	50.0	95.0
Europe	4	55.1	43.8	69.2
South-East Asia	47	81.0	48.8	89.4
Western Pacific	15	78.1	58.6	86.6
% Medicines Prescribed by Generic Name				
Africa	89	60.0	36.1	80.0
Americas	14	67.3	52.0	74.0
Eastern Mediterranean	16	27.7	12.5	81.3
Europe	14	48.9	34.0	63.0
South-East Asia	50	44.0	17.1	69.8
Western Pacific	9	78.0	64.5	88.1
% Patients with an Antibiotic Prescribed				
Africa	135	47.0	38.0	55.5
Americas	28	39.3	30.9	65.6
Eastern Mediterranean	39	53.2	40.5	62.3
Europe	16	33.5	24.3	55.8
South-East Asia	94	46.3	36.0	55.0
Western Pacific	30	45.0	27.4	60.0
% Patients with Injection Prescribed				
Africa	124	27.5	17.6	38.0
Americas	14	13.2	10.5	24.0
Eastern Mediterranean	34	20.1	8.0	47.2
Europe	14	17.2	13.0	30.0
South-East Asia	61	9.1	5.0	17.0
Western Pacific	21	23.2	7.0	35.5
% Treated According to Clinical Guidelines				
Africa	106	43.2	19.0	62.0
Americas	28	39.3	21.5	52.2
Eastern Mediterranean	16	36.8	23.0	46.7
Europe	4	37.2	17.8	39.7
South-East Asia	37	28.7	15.0	42.8
Western Pacific	14	28.4	12.4	42.9
Average Number of Medicines per Patient				
Africa	145	2.6	2.1	3.2
Americas	32	1.8	1.3	2.3
Eastern Mediterranean	41	2.7	2.3	3.6
Europe	22	2.5	1.8	2.9
South-East Asia	105	2.5	2.1	2.9
Western Pacific	25	2.6	2.2	3.7

Annex Figure 2.2: WHO/INRUD patient care indicators by WHO region				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Prescribed Medicines Dispensed				
Africa	60	86.0	76.9	90.0
Americas	13	69.4	65.5	84.3
Eastern Mediterranean	12	95.0	80.4	97.0
Europe	3	69.6	61.0	98.0
South-East Asia	27	81.2	66.0	90.3
Western Pacific	13	100.0	87.0	100.0
% Medicines Adequately Labeled				
Africa	34	49.3	20.2	69.5
Americas	5	49.0	24.0	74.5
Eastern Mediterranean	13	38.0	12.6	84.0
Europe	1	100.0	100.0	100.0
South-East Asia	19	0.0	0.0	70.0
Western Pacific	12	81.9	51.1	100.0
% Patients Given Dosage Instructions				
Africa	49	46.0	32.0	60.2
Americas	16	36.5	22.3	71.2
Eastern Mediterranean	9	51.0	31.3	61.0
Europe	3	56.0	14.0	93.0
South-East Asia	14	41.3	15.0	64.0
Western Pacific	12	55.0	49.0	67.0
% Patients with Knowledge of Correct Dose				
Africa	78	68.5	46.0	80.0
Americas	21	64.0	55.0	88.5
Eastern Mediterranean	18	61.2	56.2	75.5
Europe	4	77.0	49.5	90.5
South-East Asia	41	57.7	47.6	75.0
Western Pacific	18	73.5	55.0	88.3
Average Consultation Time (minutes)				
Africa	33	5.1	3.8	6.1
Americas	5	10.0	6.7	14.0
Eastern Mediterranean	12	4.0	3.2	5.2
Europe	1	2.0	2.0	2.0
South-East Asia	20	3.5	1.9	4.8
Western Pacific	3	7.4	4.4	7.8
Average Dispensing Time (seconds)				
Africa	25	84.0	37.0	132.0
Americas	1	17.0	17.0	17.0
Eastern Mediterranean	7	102.0	30.1	149.0
Europe	1	29.7	29.7	29.7
South-East Asia	13	51.0	31.0	102.0
Western Pacific	3	14.8	8.0	235.0

Annex Figure 2.3: WHO/INRUD health facility indicators by WHO region				
Indicator and category	**Sample Size**	**Median**	**25th %ile**	**75th %ile**
% Key Medicines Available in Facility				
Africa	85	81.5	70.0	89.0
Americas	29	66.9	57.1	79.5
Eastern Mediterranean	9	92.0	83.0	97.0
Europe	3	30.0	28.0	64.9
South-East Asia	33	81.1	69.9	89.4
Western Pacific	23	80.0	64.0	86.7
Availability of Clinical Guidelines				
Africa	46	55.3	34.0	79.5
Americas	13	46.0	17.4	70.0
Eastern Mediterranean	7	91.0	52.0	94.0
Europe	2	3.5	0.0	7.0
South-East Asia	9	51.0	38.0	65.8
Western Pacific	9	83.0	67.0	96.0
Availability of EML or Formulary				
Africa	28	51.5	17.3	82.9
Americas	10	58.5	39.3	87.5
Eastern Mediterranean	6	59.5	44.0	93.0
Europe	1	100.0	100.0	100.0
South-East Asia	9	4.8	0.0	16.0
Western Pacific	7	80.0	12.5	100.0

Annex Figure 2.4: ARI treatment indicators in studies that included patients of all ages by WHO region

Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Cases of URTI Treated with Antibiotics				
Africa	36.0	73.0	51.1	89.8
Americas	20.0	54.7	21.2	73.9
Eastern Mediterranean	11.0	53.0	43.4	67.9
Europe	15.0	62.4	24.0	73.0
South-East Asia	18.0	50.2	26.0	70.0
Western Pacific	26.0	37.4	24.0	64.9
% Pneumonia Cases Treated with Recommended Antibiotics				
Africa	50.0	58.5	34.0	78.0
Americas	21.0	70.0	45.0	87.5
Eastern Mediterranean	11.0	71.1	60.4	75.0
Europe	8.0	60.6	33.5	74.5
South-East Asia	14.0	52.5	12.5	76.4
Western Pacific	12.0	74.3	64.5	91.0
% Treated According to Clinical Guidelines				
Africa	27.0	43.0	22.5	60.0
Americas	11.0	51.4	39.2	66.0
Eastern Mediterranean	8.0	40.4	29.2	55.8
Europe	1.0	38.9	38.9	38.9
South-East Asia	10.0	33.1	12.5	43.3
Western Pacific	8.0	28.4	13.0	40.6
% ARI Cases Treated with Cough Syrups				
Africa	11.0	34.5	15.6	49.9
Americas	4.0	51.5	41.5	63.8
Eastern Mediterranean	8.0	49.5	27.1	79.4
Europe	0.0	.	.	.
South-East Asia	8.0	35.8	23.8	57.0
Western Pacific	5.0	61.5	32.9	64.0

Annex Figure 2.5: Diarrhoea treatment indicators in studies that included patients of all ages by WHO region

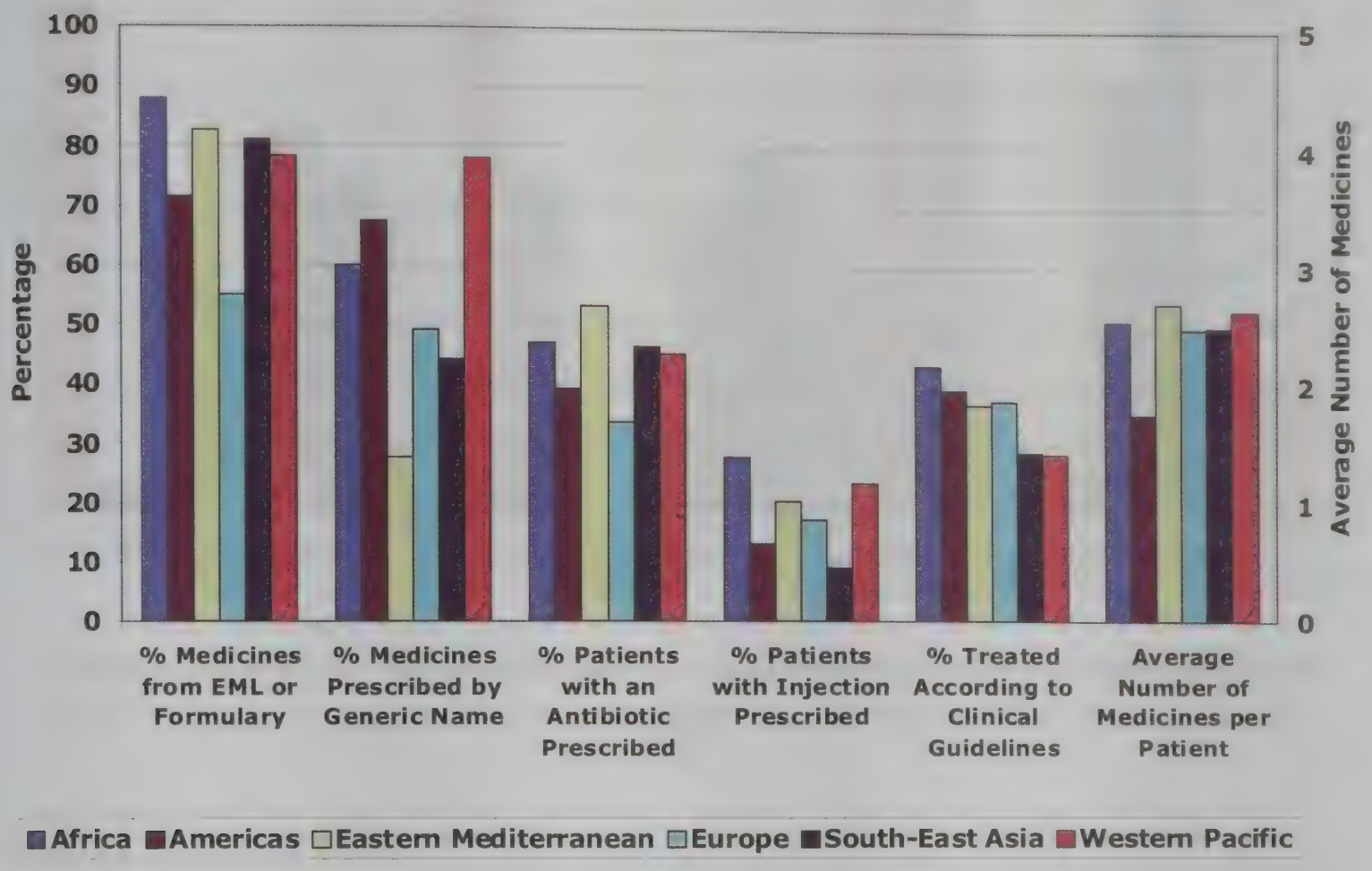
Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Diarrhoea Cases Treated with Antibiotics				
Africa	45	42.0	20.2	63.0
Americas	30	40.0	21.7	57.5
Eastern Mediterranean	14	24.6	17.4	40.6
Europe	1	31.0	31.0	31.0
South-East Asia	34	53.8	35.7	83.0
Western Pacific	10	50.0	33.3	60.0
% Diarrhoea Cases Treated with Antidiarrhoeals				
Africa	36	10.0	3.7	36.0
Americas	17	17.5	9.5	26.3
Eastern Mediterranean	10	19.6	18.7	38.6
Europe	1	11.0	11.0	11.0
South-East Asia	21	18.4	11.9	40.0
Western Pacific	6	7.5	0.0	13.0
% Diarrhoea Cases Treated with ORT				
Africa	64	55.0	30.1	77.8
Americas	25	43.0	10.0	60.0
Eastern Mediterranean	17	45.1	33.3	57.0
Europe	1	0.0	0.0	0.0
South-East Asia	41	54.7	30.1	80.0
Western Pacific	11	48.3	28.6	82.0
% Treated According to Clinical Guidelines				
Africa	32	43.5	19.5	57.5
Americas	17	39.3	23.0	53.0
Eastern Mediterranean	6	26.4	11.0	47.0
Europe	2	19.4	0.0	38.9
South-East Asia	16	20.0	9.7	31.3
Western Pacific	5	37.0	22.9	42.9

Annex Figure 2.6: Inappropriate antibiotic prescribing by WHO region

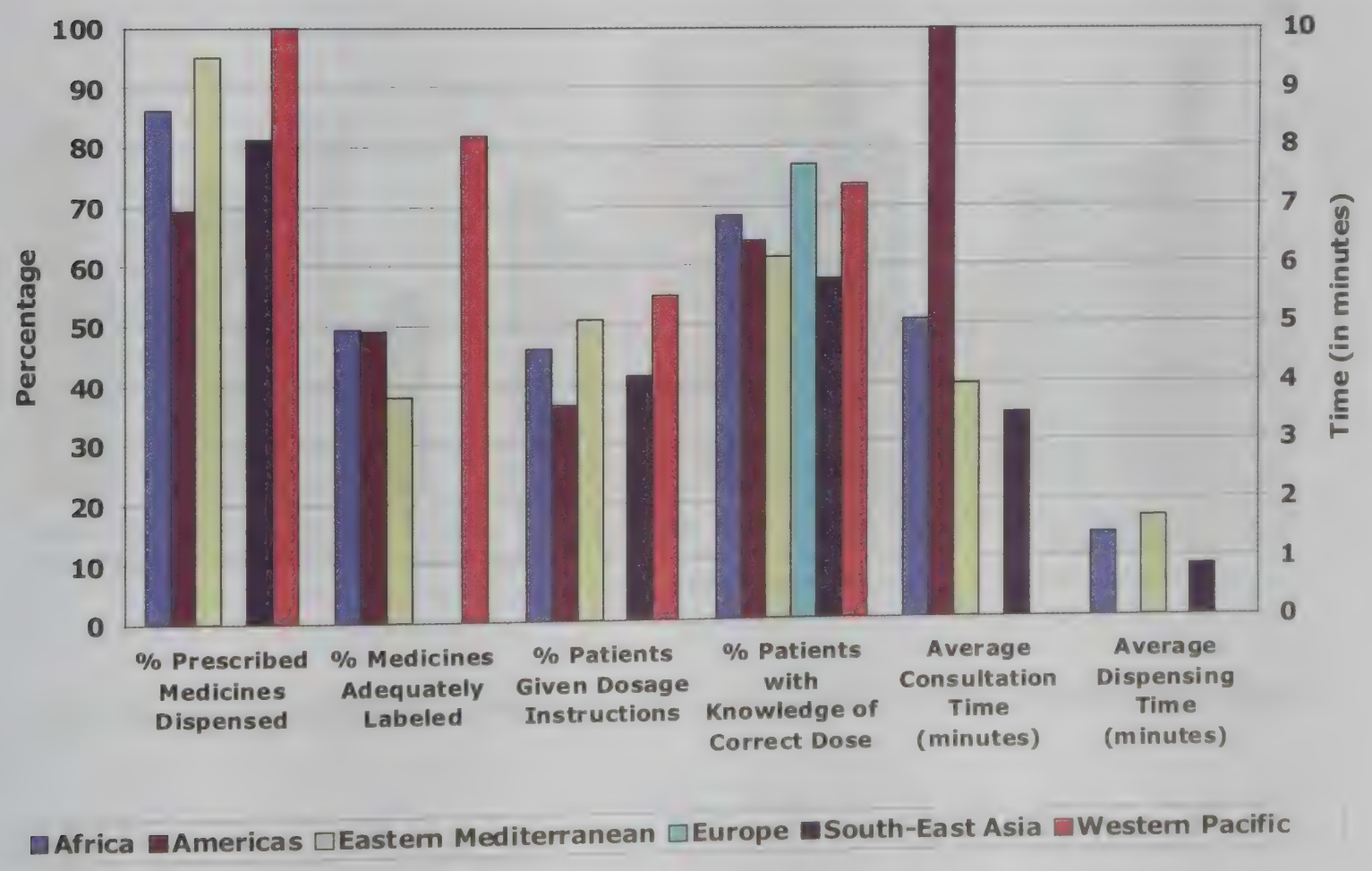
Indicator and category	Sample Size	Median	25th %ile	75th %ile
% Antibiotics Prescribed in Underdosage				
Africa	11	54.8	38.5	73.0
Americas	4	67.0	60.5	76.8
Eastern Mediterranean	3	36.2	22.0	67.0
Europe	1	29.7	29.7	29.7
South-East Asia	5	40.0	22.8	55.0
Western Pacific	4	61.4	51.4	80.0
% Patients Prescribed Antibiotics Inappropriately				
Africa	104	47.3	21.5	71.5
Americas	67	37.0	19.0	59.0
Eastern Mediterranean	29	40.6	22.0	61.9
Europe	18	58.8	22.0	71.0
South-East Asia	61	54.0	34.0	74.0
Western Pacific	42	41.7	27.7	60.0

ANNEX 2: RESULTS BY WHO REGION

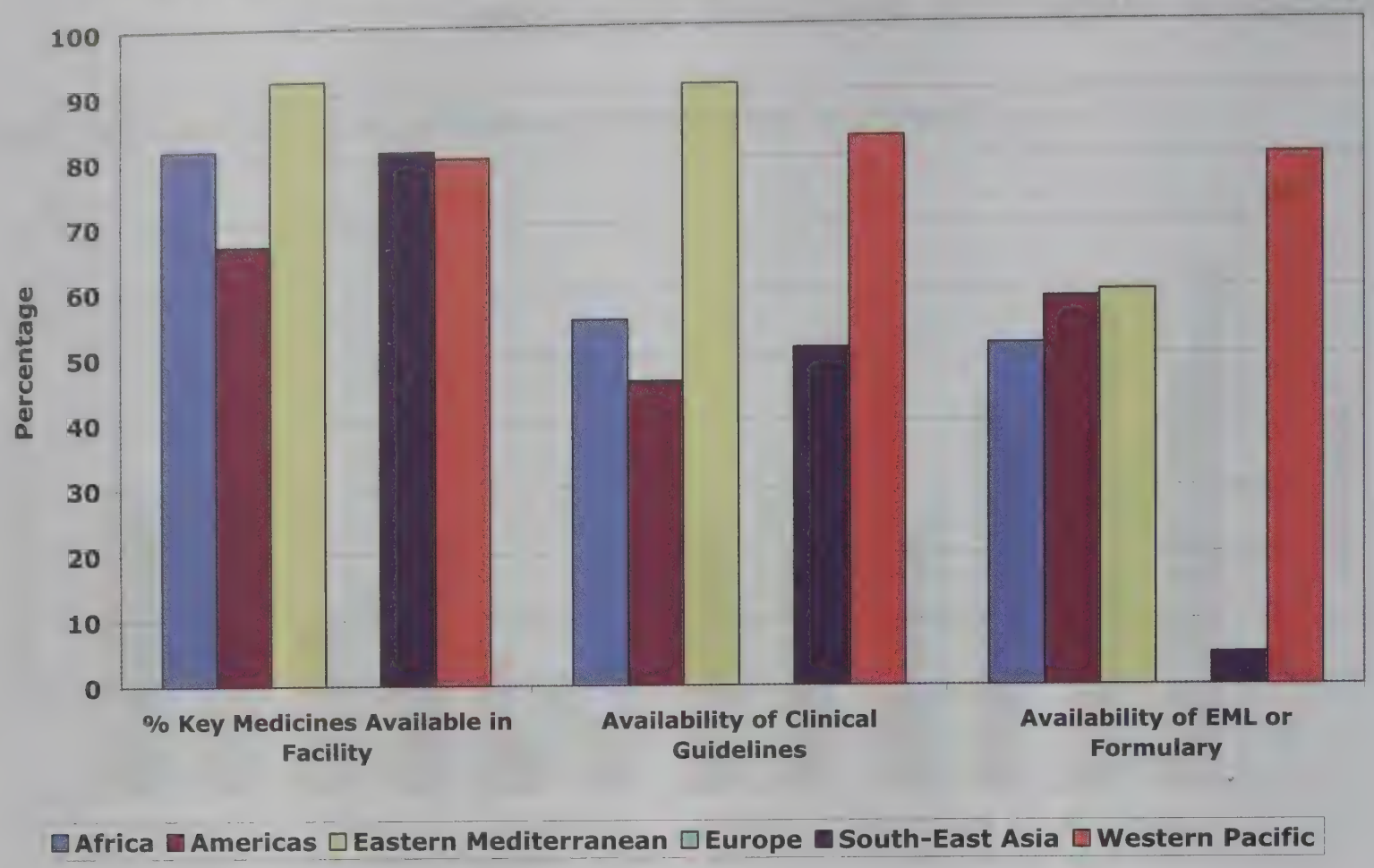
Annex Figure 2.1: WHO/INRUD prescribing indicators by WHO region



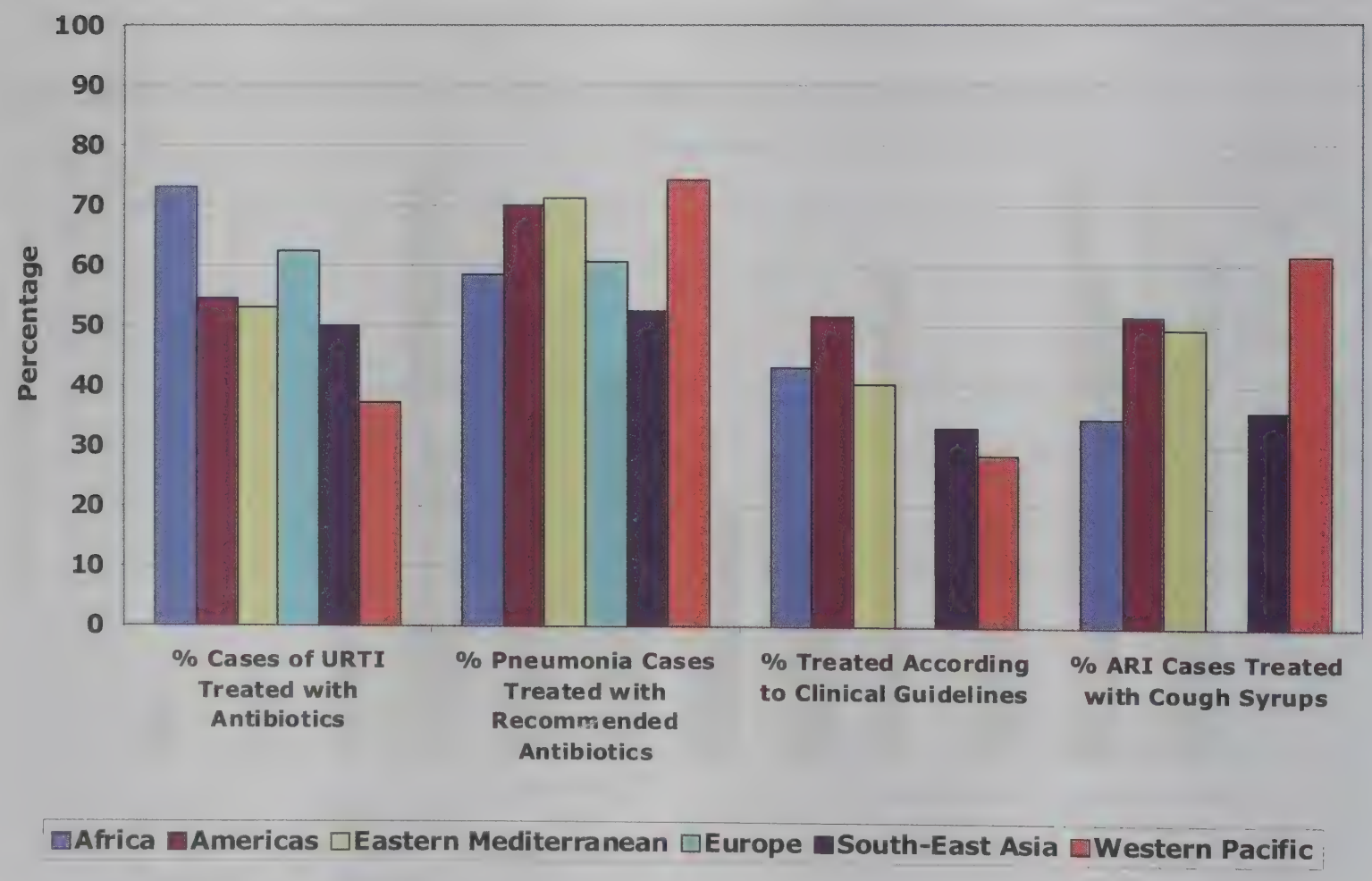
Annex Figure 2.2: WHO/INRUD patient care indicators by WHO region



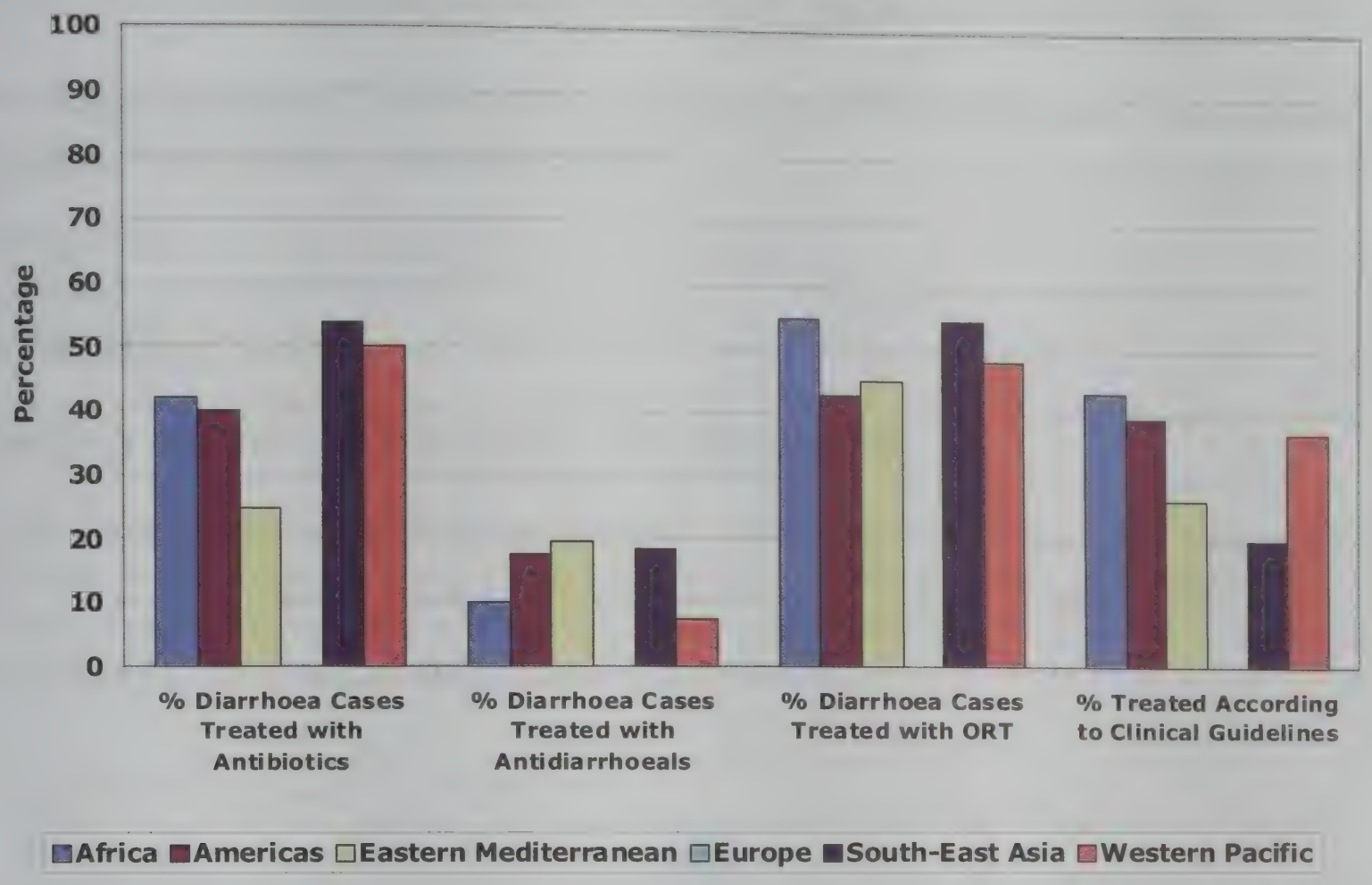
Annex Figure 2.3: WHO/INRUD health facility indicators by WHO region



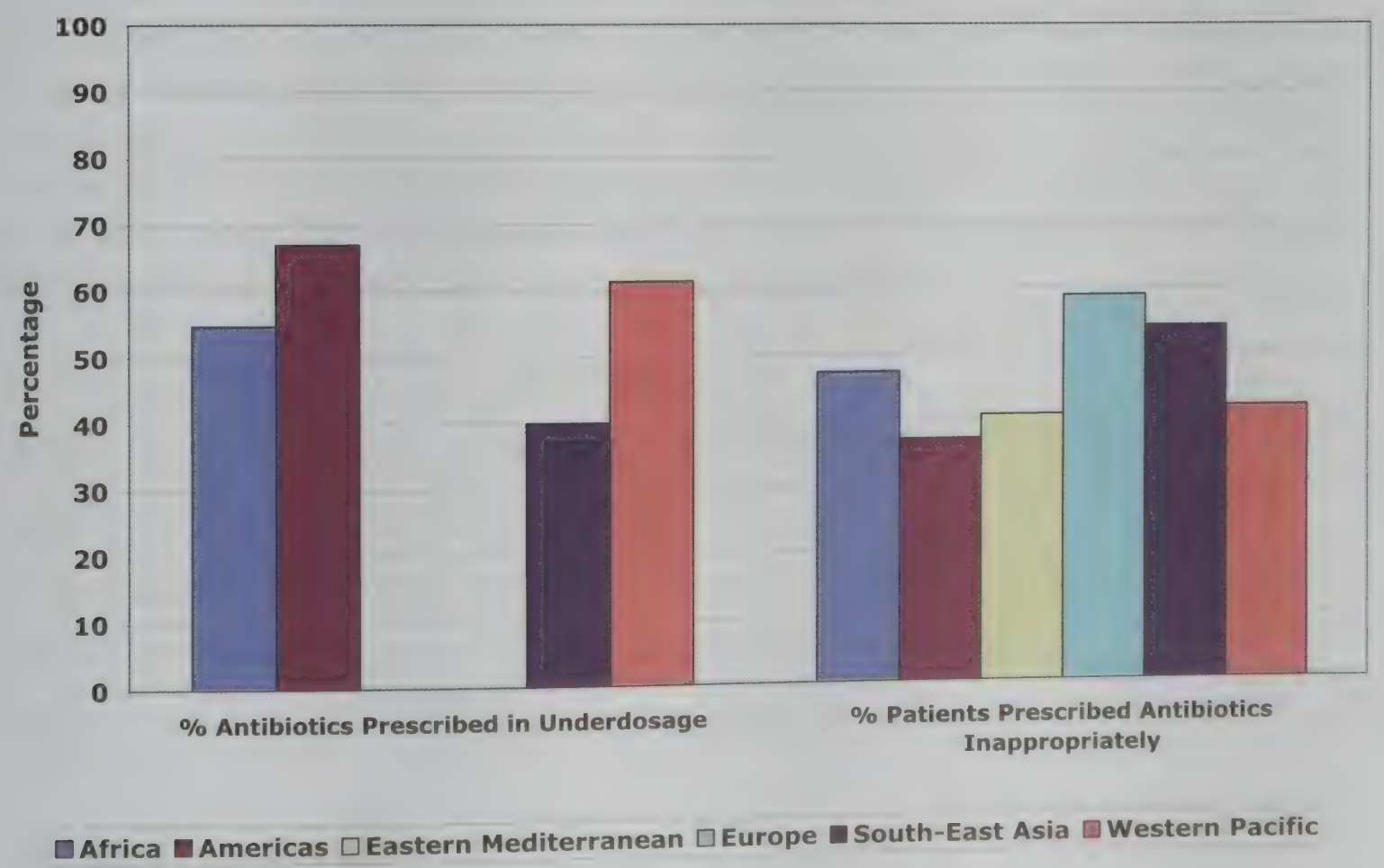
Annex Figure 2.4: ARI treatment indicators in studies that included patients of all ages by WHO region



Annex Figure 2.5: Diarrhoea treatment indicators in studies that included patients of all ages by WHO region



Annex Figure 2.6: Inappropriate antibiotic prescribing by WHO region



ANNEX 3: WHO INDICATORS DATABASE MANUAL

Database on drug* use in developing and transitional countries — Manual, WHO/EMP, Geneva, 2007

Authors: Kathleen Holloway and Verica Ivanovska

INTRODUCTION

Entering articles or reports in the database

One of the objectives of the drug use database is to be able to monitor how much work has been done in this area over time. Therefore a very important principle underlying data-entry into the database is to enter one record for one described study or survey and to avoid duplication of any particular study within the database.

The definition of a "study"** or "survey" is:

Quantitative data on drug use by a specified drug user in a specified country in a specified time period.

Often one article or report describes only one study or survey in which case one record is entered into the database for that article or report. However, this may not apply in two circumstances. Firstly, studies or surveys may be described in more than one report or article - in which case up to three references (of articles or reports) may be entered into the database to cite the one study or survey. Secondly, articles and reports may describe more than one study or survey - in which case each described study or survey is entered as a separate record, i.e. one article/report may be divided into two or more records. Division of one article or report into two or more studies/surveys, to be entered into the database as separate records, should normally only be done according to:

- time period if there is no associated intervention,
- drug outlet type (e.g. primary health-care facility, hospital, drug shop)
- drug outlet ownership (e.g. public, private)
- prescriber type (e.g. doctor, paramedic, nurse, layperson)
- dispenser type (e.g. pharmacist, paramedic, trained layperson)
- patient type only in terms of inpatient or outpatient when all the above criteria are the same.

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* The words "drug" and "medicine" are used interchangeably in the manual.

** The word "study", together with the word "survey" in the manual is used to define and refer to database records. This is different from the use of the word "study" in the analysis (see Section 2.7).

Articles/reports should not be divided on the basis of patient age or disease type for entry into the database. The following classifications would apply in deciding whether an article or report describes one or more study.

Different time periods

If no interventions are described in association with the drug use data, then surveys done at different time periods on the same drug users are entered in different records. If interventions are described in association with the drug use surveys, then the surveys done at different time periods on the same drug users in association with the intervention(s) are entered in the same record. For example, for a pre-post study to evaluate an intervention, the pre-intervention and post-intervention surveys should be entered in the same record. Different drug use surveys for different years done not in association with any intervention(s), but described in one report, should be entered as different records.

Different drug outlet type, outlet ownership, prescriber & dispenser type

If drug use indicators are described separately for different drug outlet types or ownership or different prescriber/dispenser type, then the results for each type of facility or prescriber/dispenser should be entered as a separate record. If the drug use indicators are described for different types of facility or prescriber, combined, then only one record may be entered and the appropriate mixed category for outlet type or prescriber type chosen from the menu (see Section 1).

Different patient type

If an article/report describes drug use indicators separately for inpatients and outpatients that are treated in the same facilities and by the same prescribers, then the results for inpatients and outpatients should be entered into the database as separate records. In all other circumstances studies or surveys will be divided into different records on the basis of facility or prescriber type rather than patient type (see Section 1).

Different patient age

If an article/report describes drug use separately for patients of different ages, the study/survey should be entered into the database as one record. Such a survey should ***not*** be divided into two records merely on the basis of patient age even if this means that certain general drug use indicators have to be calculated by averaging across results for different patient ages. Some articles/reports may describe some drug use indicators for all ages and some for children < 5 years. In such articles/reports, the age group relating to the majority of drug use indicators should be chosen and notes made in Sections 3 and 4 about indicators relating to the age group not chosen in Section 1.

Different diseases

If an article/report describes drug use for different diseases, the study/survey should be entered into the database as one record. Such a survey should ***not*** be divided into two records merely on the basis of disease even if this means that certain general indicators that

are not specific to a disease (e.g. % patients treated in compliance with standard treatment guidelines), have to be calculated by averaging across results for different diseases.

Entering a new study or survey

To enter a new study, click the cursor on the starred right-hand arrow at the bottom of section one to get a new blank record.

Survey ID (auto-generated) and country name

These two boxes (in yellow and above the section menu) are automatically generated once one chooses a country from the menu in the first upper left-hand box in section 1. The Survey ID number generated should be written on the hard copy of the article in order that the record for that article may be easily found in the database.

Searching for a study

It is very useful to be able to search the database for specific studies or surveys on the basis of different fields (boxes) in order to:

- check what studies or surveys have been entered into the database
- check the accuracy of data entered into the database

In order to search for records, put the cursor in the field (box) you wish to search by, e.g. country or ID number or year of survey. Then click on the binocular icon in the menu of the access software. A "Find and replace" box will appear, usually in the "Find" mode by default. If the box is in the "Replace" mode, it must be changed to the "Find" mode by clicking on "Find " at the top of the "Find and replace" box. Place the cursor in the "Find what" blank space in the box and type in what it is you wish to search for - ID number, country, year of survey, etc. The next record with the specification you have searched by will then appear.

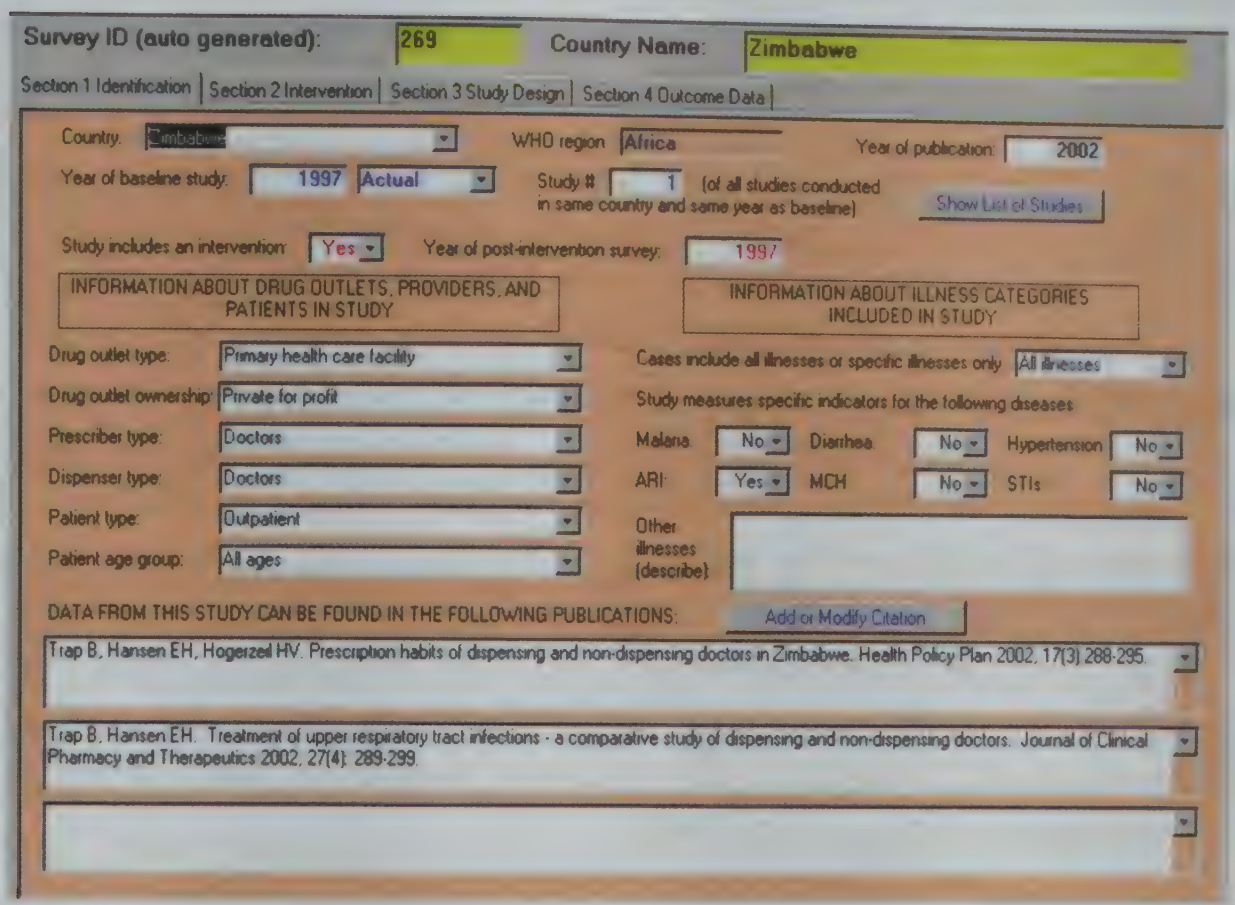
Deleting a record

Sometimes a record must be deleted when it is later found that a study/survey has been entered twice into the database. This may easily happen when the same study/survey has been published in different journals.

In order to delete a record, place the cursor in any field (box) in section 1 and then click on edit. You may then select and click on delete. You will then be asked if you really want to delete the record and that deleting the record will delete all the associated cascades of tables. You should say "yes" only if you are sure that you want to delete the record completely. A complete record (all sections) cannot be deleted if the cursor is placed in any section apart from section 1. (Blank outcome field boxes can be deleted in section 4, by clicking on the first blank box underneath a filled in box, then going to edit and choosing to delete a record.)

SECTION 1

This section contains fields where demographic information about any study or survey may be entered. The figure below shows the appearance of the data-entry interface.



Country

Select the country from the menu. The countries listed are those recognized by the United Nations. Certain countries such Palestine, Taiwan, Hong Kong, Tibet are not recognized by the UN. In these cases the country of closest affiliation must be selected e.g. Israel in the case of Palestine and China in the cases of Taiwan, Hong Kong and Tibet. If one article or report covers 2 or more countries, separate records must be entered for each country. This box must be filled in.

WHO Region

This is automatically generated.

Year of publication

Type in the year the article or report was published. If the year of publication is unknown every effort should be made to trace the authors to find out the year of publication; lack of this information casts doubt on the authenticity and usefulness of the survey within the database.

Year of baseline study

There are two boxes here. In the first box, type in the first year of any data collection period that is reported. In the case of studies where there is data collection at different time periods (e.g. pre-post studies) it is the year of the first data collection period that should be entered. In the second box, one must choose between "actual" meaning that the year was actually stated in the article or report or "estimated" meaning that the year has been calculated from other indirect information stated in the article. If the year of baseline survey is unknown the boxes should be left blank.

Study # and Show list of studies

The box "study #" is designed to help one keep track of the number of baseline studies already entered for the specified country each year. Before entering a number in the "study #" box for a new record, the data-entry person should click on box "show list of studies" to see if there are any other records already entered for that country with a baseline survey done the same year. If there are no other records entered with a baseline survey for the same year as the study being presently entered, then "1" may be entered in the "study #" box, as this is the first baseline survey in the database for this country in this year. If there are already studies entered with baseline surveys for the same year in question, then the next consecutive number should be entered in the "study #" box. For example, if there are already two studies entered with baseline surveys for the same year as the study being presently entered, then "3" should be entered in the "study #" box as this is the third survey in the database for this country in this year. The "study #" cannot be filled in for those studies where the year of baseline survey is unknown.

Sometimes, the field "show list of studies" does not show the studies until a citation has been entered into the "citation" box and the database (not the software) been subsequently closed and reopened. In such circumstances "study #" can only be entered once the citation has been entered into the citation box and the database closed and opened again.

Study includes and intervention

This box should be marked as "yes" if there is any kind of intervention that the authors say is being evaluated, even if one feels that the data they present or the study design used is not adequate for evaluating the intervention. If no intervention is described, the box should be marked "no".

Year of post intervention survey

This box should only be filled in for those studies with an intervention. The final year of any data collection is the year that should be entered. Thus for studies with several data collection periods post-intervention, it is the year of the final data collection period that should be entered.

If the date or year of the post intervention survey is not given, and the intervention takes less than six months, then it is considered that the post intervention survey takes place the same year as the baseline survey. If the intervention takes more than six months, then the post intervention survey takes place one year after the baseline survey.

Drug outlet type

Select the drug outlet type from the menu.

Drug outlet type (e.g. hospital, PHC, shops, etc) refers to ***which health facility's*** drug use is measured (and not to the intervention target group or place of recruitment of interviewees). For example, if an intervention targets consumers through the media or community health worker home visits but it is drug use in primary health-care facilities that is actually measured through a prescription survey, then the drug outlet type is "primary health-care facility". If exiting patients are interviewed at health facilities about their drug use practices at home for the current illness prior to coming to the health facility then the drug outlet type is "household". If householders are interviewed about treatment received for the current illness from the local primary health-care facility, then the drug outlet type is " primary health-care facility". If the drug outlet type differs from where the data has been collected, a note should be made about this in section 3.

Drug outlet type, a "chemist/pharmacist" describes shops where only drugs are sold and a "shop" describes shops which sell drugs and other commodities or drug pedlars.

Drug outlet type, "household", refers generally to household drug use. Thus, the prescriber type should be "self" or "community health worker" (in the case of community programmes using community members to deliver treatments) , or "don't know (if a variety of health-care providers are used). Where the prescriber type is a health professional e.g. doctor, the drug outlet type would be the place where the professional works in e.g. "hospital" and not the "household", even if the information were collected by household survey.

If outcome variables are reported for a mixture of drug outlet or facility types, normally the mixed variable response can be used e.g. "Hospital and PHC facility". If there is no equivalent mixed variable response, e.g. shops and household, then the drug outlet type should be "don't know" if no particular facility type predominates by 80% or more. If one particular facility type predominates by 80% or more, then that facility type should be used rather than "don't know ". In all cases, a note should be made in section 3 of the % distribution of drug outlet or facility types.

Drug outlet ownership

Select the drug outlet ownership from the menu.

Drug outlet ownership refers to the distinction between public or private facilities. Private facilities are divided into private-not-for-profit facilities which include mission and other charitable facilities and private-for-profit facilities which include all commercial institutions and private practitioners.

Drug outlet ownership is not applicable in household surveys where the outcome variable in section 4 is not specific to a particular prescriber.

If outcome variables are reported for a mixture of facility ownership, then the facility ownership should be "don't know" if no particular type of facility ownership predominates

by 80% or more. If one particular type of facility ownership predominates by 80% or more, then that type of ownership should be used rather than "don't know ". In all cases, a note should be made in section 3 of the % distribution of types of facility ownership.

Prescriber type

Select the prescriber type from the menu.

Prescriber type (e.g. doctor, paramedic, etc) refers to ***whose*** prescribing is measured. This may not necessarily be the persons interviewed or observed. For example, if exiting patients are interviewed at health facilities about their drug use practices at home for the current illness prior to coming to the health facility then the prescriber type is "self". If householders are interviewed about treatment received for the current illness from the local primary health-care facility staffed by paramedics, then the prescriber type is "paramedic ". If prescriptions from hospital doctors are collected from pharmacy shops, then the prescriber type is "doctor". If the prescriber type differs from where the data has been collected, a note should be made about this in section 3.

Prescriber type refers to the main prescriber in the study irrespective of whether the intervention is aimed at that prescriber or whether there are prescribing outcome variables. If the outcome variables in section 4 are not specific to a particular prescriber type, then prescriber type is “don’t know”.

If prescriber type is only referred to as "Health worker" with no other description, then the prescriber type is classified as "paramedical".

In household surveys, where the source of treatment from various providers is ascertained by interview, the prescriber type is often “don’t know” because people consult various prescribers; in this case a note of the % of people consulting different prescribers should be made in section 3 under “comments about study design”. If drug use indicators are provided for one specific prescriber type then this can be entered rather than "don't know". The only time when the prescriber type is “self” is in studies where there has been a study specifically investigating community members self medicating. Normally, if drug outlet type is marked as household, then the prescriber type should be either "don’t' know, or "self" or "community health worker" (in the case of community programmes using community members to deliver treatments).

If outcome variables are reported for a mixture of prescribers, normally the mixed variable response can be used e.g. "MD/paramedic/nurse", etc. If there is no equivalent mixed variable response, e.g. MDs and pharmacists, then the prescriber type should be "don't know" if no particular prescriber type predominates by 80% or more. If one prescriber type does predominate by 80% or more, then that prescriber type should be used rather than "don't know". In all cases, a note should be made in section 3 of the % distribution of the prescriber types.

In the case of household studies/surveys where only mortality rates and no prescribing outcomes are reported, the prescriber type is usually "don't know". In most but not all of such mortality studies the interventions target many cadres of health-care provider and the

consumer and it is impossible to say which "prescriber type" is responsible for any change in mortality. In some studies, an intervention does target one specific prescriber type, and in this case, the targeted prescriber type may be entered into the database. For example, in studies where community case management interventions have been used to decrease mortality from childhood infections, the interventions target communities, including community health worker (CHW) who live and work in these communities. Since the CHWs are known to be responsible for most of the patient care within such communities, they may be cited as the "prescriber type". All such studies should be discussed between the data-entry person and the person in charge of the database.

Dispenser type

Select the dispenser type from the menu.

Dispenser type refers to the main dispenser in the study irrespective of whether the intervention is aimed at that dispenser or whether there are dispensing outcome variables. If the outcome variables in section 4 are not specific to a particular dispenser type, then dispenser type is "don't know".

If dispenser type is only referred to as "Health worker" with no other description, then the dispenser type is classified as "paramedical".

If outcome variables are reported for a mixture of dispensers, normally the mixed variable response can be used e.g. " pharmacist and pharmacy asst.", etc. If there is no equivalent mixed variable response, e.g. "pharmacy asst. and nurses", then the dispenser type should be "don't know" if no particular dispenser type predominates by 80% or more. If one dispenser type does predominate by 80% or more, then that dispenser type should be used rather than "don't know". In all cases, a note should be made in section 3 of the % distribution of the dispenser types.

Patient type

Select the patient type from the menu.

Patients attending hospitals or clinics may be classified as inpatients or outpatients.

Patients attending primary health-care facilities are usually classified as outpatients. (If patients attending primary health-care facilities are classified as inpatients, serious consideration should be given to whether the classification of the facility type is correct).

Patients attending shops or interviewed in household surveys are classified as consumers.

For a mixture of inpatient and outpatients only, where outcome variables are not reported separately (in which case two records may be entered into the database), then the patient type should be "don't know" if no particular patient type predominates by 80% or more. If one patient type does predominate by 80% or more, then that patient type should be used rather than "don't know". In all cases, a note should be made in section 3 of the % distribution of the patient types.

Patient age group

Select the patient age from the menu:

- All (includes all ages)
- Adults
- Children less than 1 year
- Children less than 5 years
- Children above 5 years
- All children (upper age limit as defined by the article/study)
- Don't know

The age group chosen should be according to the upper age limit allowed. For example, children less than one year should be placed in the "< 1 year" category and not in the "< 5 years" category, even though they are clearly under 5 years as well as under 1 year.

If an article/report describes drug use separately for patients of different ages, the study/survey should be entered into the database as one record. Such a survey should ***not*** be divided into two records merely on the basis of patient age even if this means that certain general drug use indicators have to be calculated by averaging across results for different patient ages. Some articles/reports may describe some drug use indicators for all ages and some for children < 5 years. In such articles/reports, the age group relating to the majority of drug use indicators should be chosen and notes made in sections 3 and 4 about indicators relating to the age group not chosen in section 1.

Cases include all illnesses or specific illnesses only

Select "all illnesses" or "specific illnesses only" from the menu.

“Specific illnesses only” should be chosen if drug use for cases of specific diseases only are investigated. “All illnesses” should be chosen if drug use for all diseases are investigated. In the case of “specific illnesses only” one of the variables under the section "study measures specific indicators for the following diseases" should be marked “yes”. In other words, one or more of the variables "malaria", "diarrhoea", "hypertension", "Acute respiratory tract infection (ARI)", "Maternal child health (MCH)", "Sexually transmitted infections (STIs)" or “other illnesses” should be marked "yes".

"All illnesses" should be chosen if drug use for all cases are investigated. Even if "All illnesses” is chosen, one or more of the variables "malaria", "diarrhoea", "hypertension", "ARI", "MCH", "STIs" or “other illnesses” may still be marked “yes” if there is an indicator which is specific to a disease in the survey. For example, a general survey marked “all” may also be marked “diarrhoea=yes” if the indicator “% diarrhoea cases treated with ORT” is present.

Study measures specific indicators for the following diseases

For each box labelled "malaria", "diarrhoea", "hypertension", "ARI", "MCH", "STIs", chose "yes" or "no"

For the box labelled "Other illnesses (describe)", enter any other specific illness for which drug use has been investigated.

The specific disease boxes may be marked as "yes" if:

- a study/survey investigates drug use only for a specific disease even though general drug use indicators not specific to a disease (e.g. average number of drugs per patient) are reported.
- drug use indicators specific to a disease (e.g. % ARI cases treated with cough syrups) are reported even though other general drug use indicators for patients with all illnesses are reported.

For surveys concerning the integrated management of childhood illness (IMCI), enter "IMCI" under "other illnesses (describe)" and also insert "yes" for the fields "malaria", "diarrhoea" or "ARI" if an outcome indicator specific for these illnesses is reported. The indicators for specific illnesses are listed below:

Malaria

- % malaria cases treated with appropriate anti-malarials

Diarrhoea

- % diarrhoea cases treated with oral rehydration therapy (ORT)
- % diarrhoea cases treated with antibiotics
- % diarrhoea cases treated with anti-diarrhoeals

Acute respiratory tract infection

- % ARI cases treated with cough syrup
- % pneumonia cases treated with appropriate antibiotics
- % viral upper respiratory tract infections (URTI) treated with antibiotics

If an article/report describes drug use for different diseases, the study/survey should be entered into the database as one record. Such a survey should ***not*** be divided into two records merely on the basis of disease even if this means that certain general indicators that are not specific to a disease (e.g. % patients treated in compliance with standard treatment guidelines), have to be calculated by averaging across results for different diseases.

Data from this study can be found in the following publications

There are three boxes for up to a maximum of three references per study or survey. The reference should be chosen by clicking the cursor in the box and then selecting the reference from the menu. Previously entered references will appear in the menu. New references must be entered into the database using "Add or modify citation" (see below).

Add or modify citation

To enter a new citation into the database, click the cursor on the "Add or modify citation" box. Once the box appears, click on starred right arrow at the bottom of the box. A new "RUD_Citations" box will appear into which the new citation may be typed. Immediately one starts typing in a new citation, an automatic publication number is generated. Once the citation has been typed, the "RUD_Citations" box may be closed by clicking on the "x" at the top right-hand corner of the box.

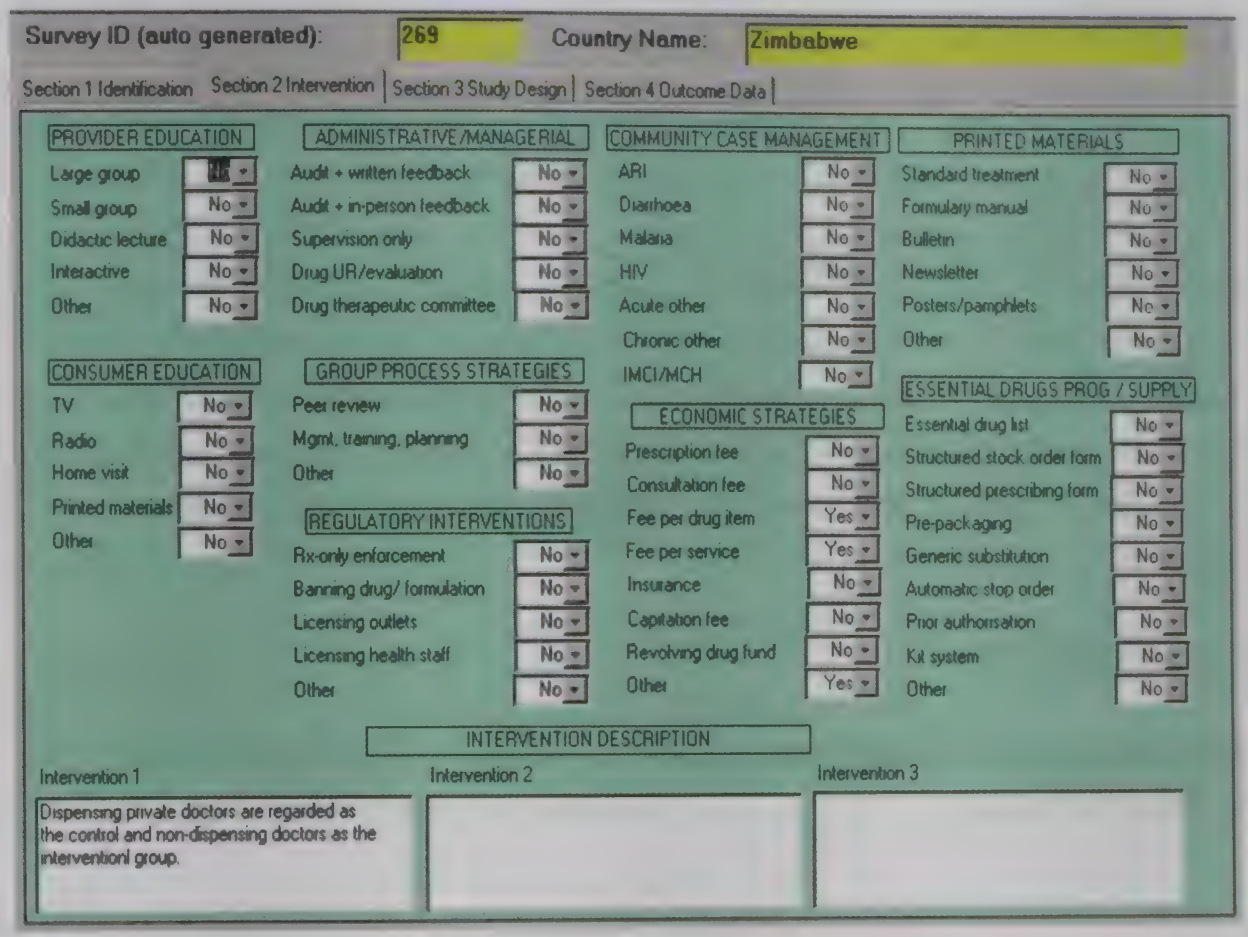
Sometimes the new citation is immediately available in the menu in the boxes under "Data from this study can be found in the following publications". However, usually one must close the database (not shut down the software) and re-open the database again in order to find the new citation in the menu available in these boxes.

To modify a citation already in the database, click the cursor on the "Add or modify citation" box. Once the box appears, click on the right-hand or left-hand arrows (not starred) to search the already existing citations which appear in alphabetical order. Once the required citation appears in the "RUD_Citations" box, it can be edited.

The citations should be typed in the same manner, normally starting with the authors, then the date, the title of the article, the journal, the volume number and lastly the page numbers. Using the same format for typing in the citations will facilitate searching for references.

SECTION 2

This section contains fields where information about interventions conducted in association with the drug use studies/surveys may be entered. The figure below shows the appearance of the data-entry interface.



All relevant components of a package of interventions for however many intervention groups within a study/survey should be ticked "yes" even though:

- a description is made in the intervention box(es), and
- not all groups within a study have received all components of every intervention.

Under "intervention description" at the bottom of section 2, there are 3 boxes labelled "intervention 1", "intervention 2", "intervention 3". Normally a description of the intervention should be entered into one or more of these boxes. The database can accommodate up to 3 intervention groups and one control group within one study/survey entered as one record. Where there is more than one group receiving an intervention, a description of each intervention or package of interventions for each different group must be entered into intervention boxes provided.

The section on interventions is divided by major type of intervention and again subdivided by different interventions that may be undertaken with each major type of intervention.

Each section has a box "other" for interventions that are not adequately described by the interventions listed under each category. The major types of intervention are:

- Provider education
- Administrative/managerial
- Community case management
- Printed materials
- Consumer education
- Group process strategies
- Regulatory interventions
- Economic strategies
- Essential Drugs Programme/Supply

In some studies, information is given about the extent to which the intervention is implemented e.g. coverage. For example, in IMCI studies, there is an indicator "% health facilities with at least 60% of health workers who manage children trained in IMCI". This should be recorded in the intervention box.

Provider education

A provider is anybody delivering health services even if s/he is not qualified in any way to be providing those services.

Types of activity conducted during educational programmes, including continuing medical education, should if possible be identified. Often there are different components which may require entering "yes" in different boxes within the section on provider education and maybe also in other sections.

Large group provider education consists of > 15 participants and small group education consists of < 15 participants.

Administrative/managerial

Interventions in this group include supervision, audit, drug and therapeutic committees and drug use evaluation (Drug UR / evaluation).

Drug use evaluation (drug utilization review) is a system of on-going, systematic, criteria-based evaluation of drug use that will help ensure that appropriate medicine use (at the individual patient level) is provided.

Drug and Therapeutic committees (medicine and therapeutic committees or pharmacy and therapeutic committees) is a committee designated to ensure the safe and effective use of medicines in the facility or area under its jurisdiction.

In IMCI studies mention is made of the % of health facilities that received a supervisory visit in the past 6 months. This should be noted in the intervention box and if the % of facilities receiving supervision is more than 50%, the "supervision only" box can be marked "yes".

Community case management

Interventions in this group involve trained members of the community providing treatment to members of their own community. The subcategories in this group concern the type of disease that is to be managed in the community and each box should be marked "yes" or "no" respectively.

Community case management usually involves several interventions which may be classified under other sections in addition to the "community case management" section. The relevant boxes within any section on intervention type should be marked "yes". For example, community case management may involve a package of interventions. These may include (1) training and supervision of members of the community to provide treatment for certain diseases, (2) consumer education on self treatment and (3) supplying drugs to a trained layperson. In such a case, interventions under the sections on consumer education, administrative/managerial and essential drugs programme/supply may be marked "yes". Community case management does require that patients are treated in the community by trained community members.

Printed materials

This section only refers to printed materials aimed at providers. Printed materials aimed at consumers are listed under consumer education.

Clinical guidelines (standard treatment guidelines, prescribing policies or protocols) consist of systematically developed statements to help prescribers make decisions about appropriate treatments for specific clinical conditions.

Formulary manuals are manuals containing the list of essential drugs plus information on the drugs within the list.

Newsletters and bulletins are regular publications with information on drugs and treatment.

Consumer education

This section refers to consumers only and not other members of the community who may be providing health services. For example, trained laypersons, traditional healers, informal drug pedlars are all considered providers, not consumers. Educational interventions conducted through the media (e.g. TV, radio), aimed at communities in general, including informal providers in the community (e.g. drug pedlars or traditional healers), are considered as consumer education. Only if the messages specifically target health-care providers in the media should such intervention not be considered as consumer education only.

Group process strategies

This section refers to activities where providers themselves identify a drug use problem and develop, implement and evaluate a strategy to correct the problem. Such processes may include peer review, drug and therapeutic committees, and management, training and planning activities.

Regulatory interventions

This section refers to government regulations, such as:

- licensing of prescribers,
- licensing of drug outlets,
- drug registration and banning drugs,
- limiting prescription of medicines by level of prescriber; this includes enforcing a prescription-only (Px-only) policy for certain drugs,
- monitoring of medicines promotion.

Economic strategies

This section refers to any economic incentive that may impact on drug use. The following definitions apply:

- **A prescription fee** is a fee covering all the drugs in whatever quantities written on the prescription form and paid by the patient.

- **A consultation fee** is a fee covering a consultation but not including drugs and paid by the patient.

- **A fee per drug item** is a fee for one drug paid by the patient; the exact type of fee should be specified in the intervention description and includes:
    - a fee covering a complete course (of however many tablets), which may be fixed for all drugs or vary depending on the drug
    - a fee covering one tablet which may be a % of the cost price or fixed fee per tablet

- **A capitation fee** is a fee paid to the provider by the government or an insurance company or a health maintenance organization for providing a specified package of health care to a patient over a specified time period.

- **A fee per service** is a fee paid for a service; it may be paid by the patient or by a purchaser of services on behalf of the patient (government or an insurance company or a health maintenance organization).

- **Revolving drug fund** is a drug sales programme in which revenues from drug fees are used to replenish drug supplies.

- **Health insurance** is a financing scheme characterized by risk sharing in which regular payments of premiums are made by or on behalf of members (the insured) and where the insurer pays the cost or a set proportion of the cost for covered health services; Insurance may be:
  - ***private health insurance*** where voluntary private indemnity insurance is provided by private insurance companies through employees, mutual societies or cooperatives
  - ***social health insurance*** where there is compulsory insurance provided to civil servants, people in the formal employment sector, and certain other groups through programmes such as social security funds, national health insurance funds, and other systems; premiums are often deducted directly from salaries or wages

Essential Drugs Programme/Supply

Interventions in this group include any interventions that impacts on drug supply, distribution or availability, but excluding economic incentives such as pricing or fee systems. Although drug supply and distribution systems would be included in this section, the majority of interventions here concern methods of restricting the type or quantity of drugs dispensed to patients. Such types of interventions include:

- **essential drugs list** is a list of essential drugs that satisfy the priority health care needs of the population served by the facilities in question

- **structured stock order forms**, where drugs may be ordered by filling in a structured order form

- **structured prescribing forms**, where certain drugs can only be prescribed if a particular form with more patient detail is filled in

- **pre-packaging** of dispensed medicines, such that medicines can only be dispensed in amounts consistent with a full course

- **generic substitution**, where a generically equivalent product, (with the same active ingredients in the same dosage forms and identical in strength, concentration and route of administration) is substituted by the dispenser for a branded one prescribed.

- **automatic stop order**, where drugs are automatically stopped after a fixed period of time (e.g. 3 days) and must be re-prescribed if the patient is to continue taking them.

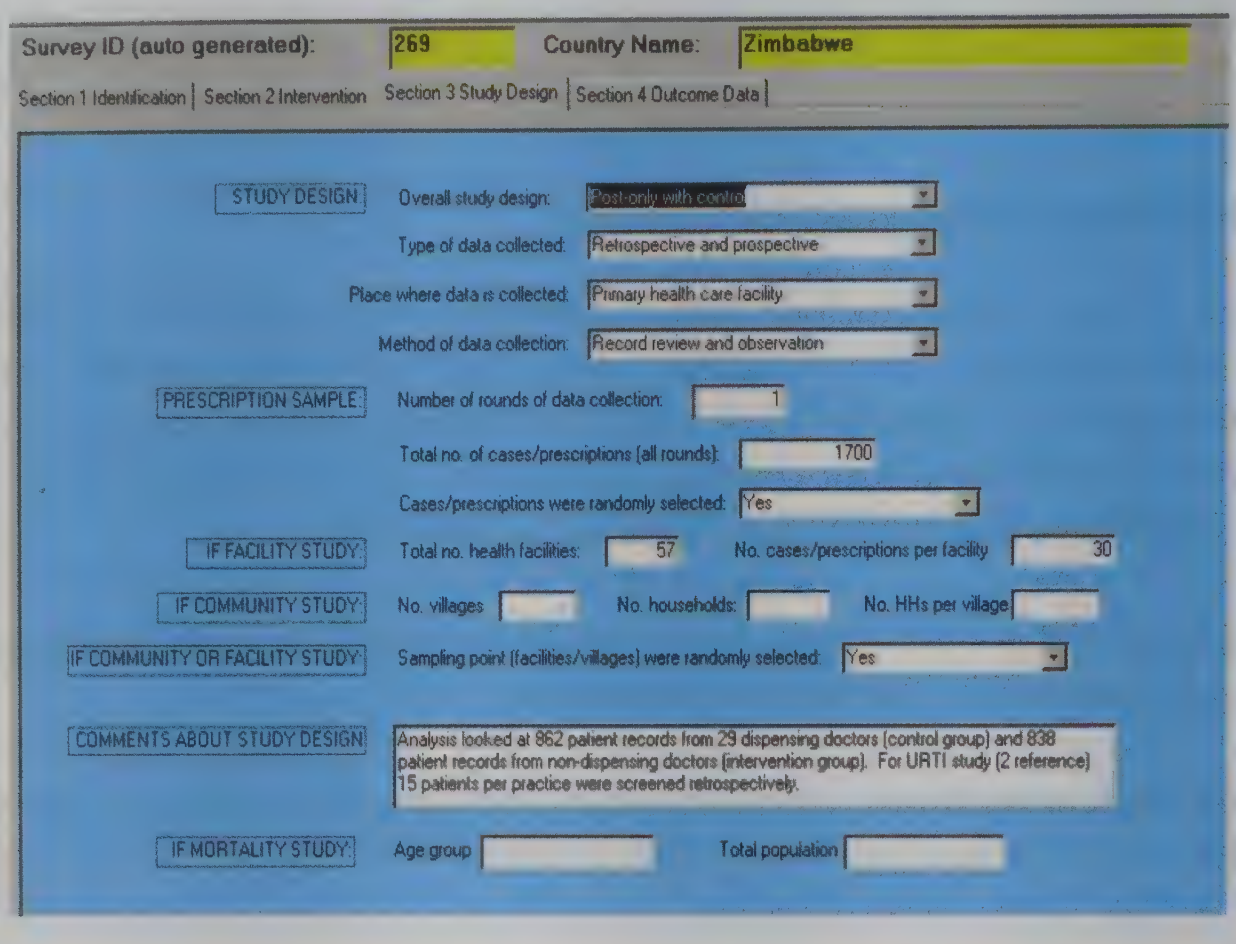
- **prior authorization**, where certain drugs can only be prescribed with the prior authorization of senior prescribers.

- **kit system**, where a fixed amount of drugs is sent to a health unit at regular intervals (e.g. 3 monthly or annually), the amount being determined in advance by the central authority (and not by local estimation).

A full essential drug programme that includes drug supply should have the "other" category marked yes in this section.

SECTION 3

This section contains fields where information about the methodology of the study or survey may be entered. The figure below shows the appearance of the data-entry interface.



Study design

Select the study design from the menu.

The study design should be defined according to the results given and entered in section 4 and not necessarily according to what is stated by the authors. For example, if a study is described as a time series with control but results for less than 4 time points are given, then the definition for the database is pre-post with control. If a study is described as a pre-post with control but no pre-intervention measurements are reported then the definition for the database is post-only with control.

Post intervention survey without control is defined as a cross sectional survey.

Time series study design is defined as having more than 4 data points.

Type of data collected

Choose retrospective or prospective. Interviews or observation can only be done prospectively.

Place where data is collected

This refers to ***where the data is collected*** and not to whose drug use is measured. For example, if data on prescriptions from the primary health facility is collected during a household survey, then the place of data collection is the household and not the primary health-care facility. Similarly if data on treatment taken at home is collected during exiting patient interview at the primary health-care facility then the place of data collection is the primary health-care facility and not the household.

Method of data collection

This refers to whether data is collected by record review, observation and/or interview. Simulated patient surveys are counted as observation. Patient knowledge can only be collected by interview.

Number of rounds of data collection

This refers to the number of different time periods that data has been collected. The number here should be consistent with the information in section 3 on "study design" and in section 4 on "period" and "year of measure".

Total number of cases/prescriptions (all rounds)

Total number of cases or prescriptions in the survey is calculated as a total based on all cases, prescriptions or patients in all groups in the study for all time periods of measurement. Therefore the number of cases, prescriptions or patients for all groups (control and intervention groups) at any one time period needs to be multiplied by the number of times a measurement is done. If the numbers vary for different outcomes, or different periods, then the lowest number should be chosen. The same applies for catchment's population figure for mortality rates.

Patients or prescriptions were randomly selected

Random selection of facilities does not mean that there is random selection of patients and the two should be classified separately.

Patient observations or interviews are usually convenience, not random samples unless specifically otherwise specified. If the period of time was specifically randomly chosen and either all or a random sample of patients during that time were chosen then we can say patient selection was random.

Many IMCI studies state that patient selection for observation of treatment was random but are unable to give details of random selection of patients at the health facility - in these case put "don't know" for random selection of patients.

In a household survey, the child suffering from a disease of interest is not randomly selected (although the household s/he lives in may have been randomly selected in which case the other field "Sampling point (facilities/villages) were randomly selected" will be "yes".

Total number of health facilities

Number of health facilities in the survey is based on the lowest number during any one measurement or for any time period or for any outcome variable (entered into the database). It is not calculated by multiplying up different time periods as for total number of patients/prescriptions etc. The number of facilities does include adding up all facilities from both control and intervention groups at one point in time.

Number of cases/prescriptions per facility

Number of cases/prescriptions per facility refers to the lowest number cases/prescriptions per facility at any one time period of measurement. If only the average number per facility is reported (not numbers for individual facilities) then this is reported. The number of patients/ prescriptions per health facility cannot be calculated by dividing the total number of prescriptions by the number of facilities.

Number of villages and households

Number of villages or households in a study/survey is based on the lowest number during any one measurement or for any time period or for any outcome variable (entered into the database). It is not calculated by multiplying up different time periods as for total number of patients/prescriptions etc.

The number of villages or households does include adding up all facilities from both control and intervention groups at one point in time.

Number of households per village

Number of households per village refers to the lowest number households per village at any one time period of measurement.

Sampling point (facilities/villages) were randomly selected

Choose whether selection was random or not from the menu. If nothing is stated about selection of facilities then "don't know" should be chosen. If all facilities of the population of facilities under examination are selected, then the selection is regarded as random since the outcomes will be representative of the population studied - but a note should be made in the comments box in section 3.

Comments about study design

This box allows one to comment on the methodology and note down inconsistencies and difficulties in the methodology e.g. different sample sizes for different indicators.

If mortality study: age group

The age group should be specified as less than a specified age limit. Thus children less than one year of age fall into the category "< 1 year" and not "< 5 years".

Infant mortality refers to mortality in children < 12 months

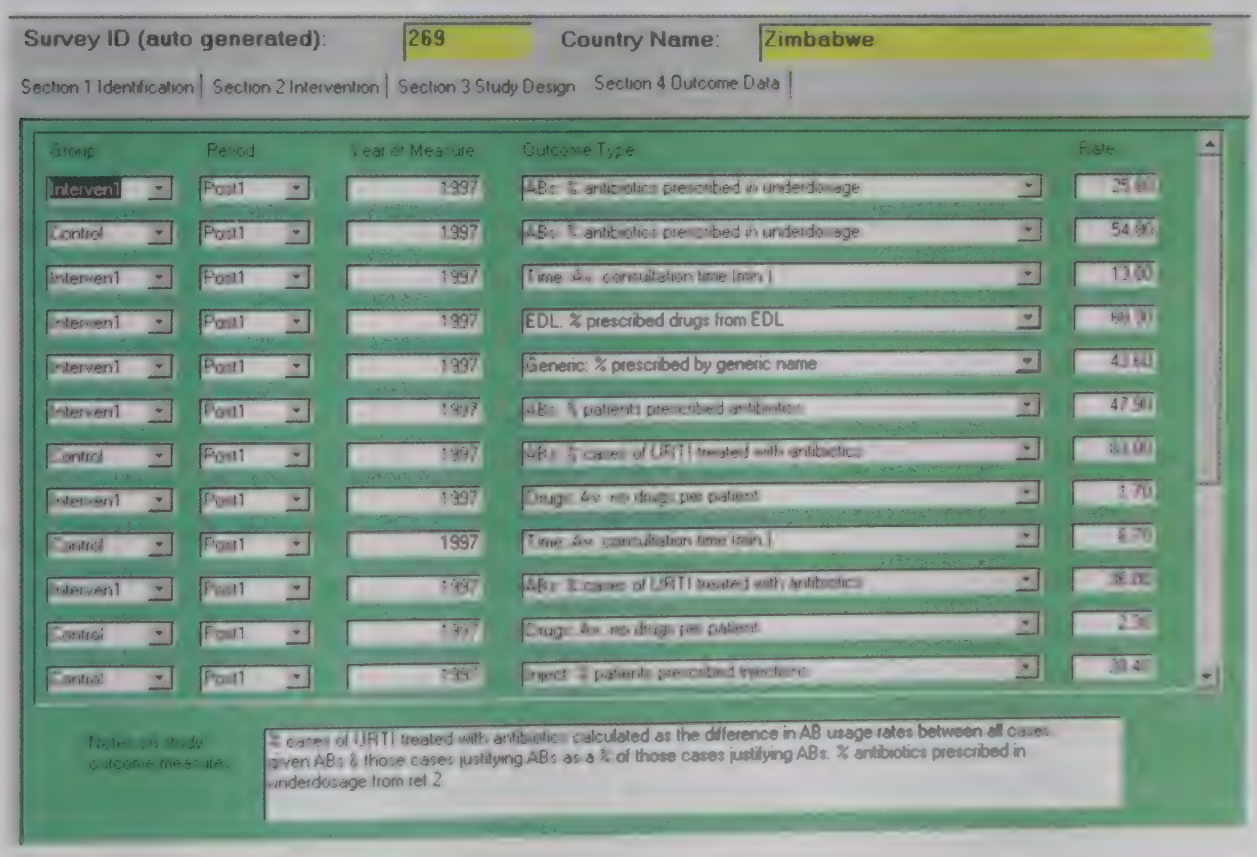
Neonatal mortality refers to mortality in children < 1 months

If mortality study: total population

The total population refers to the population at risk of the diseases of interest, not the cases of diseases themselves. The total population is used when mortality rates are reported. Total number cases/prescriptions (all rounds) refer to the total number of cases or prescriptions on which the drug use indicators are calculated.

SECTION 4

This section contains fields where quantitative information on drug use is entered. The figure below shows the appearance of the data-entry interface.



For every drug use indicator to be entered into the database, there are 5 fields (boxes) into which data should be entered:

- Group
- Period
- Year of measure
- Outcome type
- Rate

Group

The group refers to which group of people's drug use is measured. In the case of baseline studies/surveys with no intervention, the group would be "All". For intervention studies/surveys, there will be one or more intervention groups, "interven 1", "interven 2", "interven 3", and there may be a "control" group which did not receive the intervention.

Whatever is entered in "group" should be consistent with overall study design in section 3. For example, if section 3 mentions a pre-post study with control, then there should be outcome variables for control and intervention groups in section 4. If section 3 mentions a pre-post study with no control, there will only be outcome variables for intervention groups and not for a control group.

Sometimes, not all drug use outcomes (indicators) are reported for each group and then some indicators may require group categories that appear inconsistent with the study design selected in section 3. For example, a post-only with control study may report outcomes for both intervention and control groups for several indicators but only one combined result for both intervention and control groups for one indicator. In such a study, the drug use indicator reported for both intervention and control groups combined should be entered in the "Group" field (box) as "All".

Period

The period refers to period of data collection in relation to the study design. For example, in a baseline survey without an intervention, the period will be "baseline". However, if there is an intervention, then the period will be:

Baseline:	for data collected before the intervention
During:	for data collected during the intervention
Post 1:	first collection of data after the intervention
Post 2:	second collection of data after the intervention
Post 3:	third collection of data after the intervention

Whatever is entered in "period" should be consistent with overall study design in section 3. For example, a cross-sectional survey with no intervention would only have "baseline" entered as the period for each outcome variable. A post-only with control study with only one period of data collection would only have "post 1" entered as the period for each outcome variable. A time series study with no control, with data collected before, during

and 3 times after an intervention, would have for each outcome variable the periods "baseline", "during", "post 1", "post 2", "post 3". If there were more than 5 periods of data collection, then the data-entry person must choose the most appropriate periods equivalent to menu selection available (i.e. "baseline", "during", "post 1", "post 2", "post 3").

The period "during" should only be used for intervention studies:

- when data is aggregated over different areas, only some of which have implemented the intervention, or
- when data is aggregated over the pre-post period, or
- when the intervention strategies or activities are in the process of being introduced.

"During" should not be used for interventions that consist of established on-going activities and strategies e.g. insurance, supply systems, user fees, etc.

Year of measure

The year of measure is the year specified in the report/article that data collection occurred. If the year of measure is not specified or covers a period of several years, then the mid-period between when measurement started and ended should be used.

If the "period" is marked as "baseline", then the year of measure should be the same as the "year of baseline survey" in section 1. For all intervention studies/surveys, the year of measure for the final period (post 1, 2 or 3) should be the same as the "year of post intervention survey" in section 1.

Notes on study outcome measures

This box is to make comments concerning the calculation of any of the indicators, whether it be done by the authors themselves or the data-entry person. If different sample sizes have been used in the calculation of indicators this should be mentioned.

Outcome type

The outcome type refers to the drug use indicator reported. It is important to check that the definitions used by the authors are the same as the ones used in the database. Particular attention should be paid to the numerators and denominators used in calculating indicators.

ABs: % antibiotics prescribed in under dosage

$$\frac{\text{No. antibiotics prescribed in under-dose}}{\text{Total no. antibiotics prescribed}} \times 100$$

% Antibiotics prescribed in under-dosage is reported usually according to duration only but may include strength and frequency also. The definition of under-dosage should be made in section 4. If there is a choice, the study/survey should be discussed between the data-entry person and the person in charge of the database.

ABs: % antibiotics prescribed inappropriately

$$\frac{\text{No. patients prescribed antibiotics inappropriately}}{\text{Total no. patients (whether or not prescribed antibiotics)}} \times 100$$

Inappropriate use should be defined by the authors. If the authors state that viral infections are an appropriate indication for antibiotics, a note should be made in section 4. Such cases should be discussed between the data-entry person and the person in charge of the database.

For WHO/IMCI studies, the indicator "% antibiotics prescribed inappropriately" is calculated by subtracting the percentage of "Child not needing antibiotic leaves the facility without antibiotic" from 100%.

ABs: % pneum. cases w. appr. antibiotics

$$\frac{\text{No. cases of pneumonia prescribed appropriate antibiotics}}{\text{Total no. cases of pneumonia}} \times 100$$

% pneumonia cases treated with appropriate antibiotics includes any type of lower respiratory tract infection that the authors say ***do need*** antibiotics. Appropriate antibiotics should be defined by the authors. If there is no mention of the appropriateness of the antibiotic treatment, it should be assumed to be appropriate but a comment should be made in the notes box in section 4.

Classification of cases of bacterial upper respiratory tract infection (e.g. otitis media, tonsillitis) that the authors say should be treated with antibiotics should always be discussed between the data-entry person and the person in charge of the database.

In WHO, Division of Child Health and Development (WHO/CHD) control of ARI studies, the indicator "pneumonia cases managed correctly" is not the same because all aspects of case management including referral and advice are considered, not just the appropriate antibiotic. However a note of the indicator should be made in the notes box in section 4.

In WHO/IMCI studies the indicator "Child with pneumonia is correctly treated" is interpreted as "% pneum. cases w. appr. Antibiotics" because this indicator does not generally include other aspects of case management (such as dosing, referral and advice).

ABs: % cases of URTI treated with antibiotics

$$\frac{\text{No. cases upper respiratory tract infection prescribed antibiotics}}{\text{Total no. cases of upper respiratory tract infection}} \times 100$$

% of upper respiratory tract infections (URTI) treated with antibiotics includes any type of upper respiratory tract infection that the authors say ***do not need*** antibiotics. In some studies/surveys, the authors may state that viral URTI (e.g. common cold, sore throat) should be treated with antibiotics. For such studies the indicator "% cases of URTI treated with antibiotics" may still be used but a note on the authors' views on treatment should always be made in section 4.

Many ARI/IMCI studies classify ARI into either pneumonia (requiring antibiotics) or non-pneumonia (not requiring antibiotics). Non-pneumonia is classified as URTI in the database.

In WHO, Division of Child Health and Development (WHO/CHD) control of ARI studies, the indicator "ARI cases who should not receive antibiotics but were given them" is interpreted as "% cases of URTI treated with antibiotics".

ABs: % patients prescribed antibiotics

$$\frac{\text{No. patient encounters where one or more antibiotics are prescribed}}{\text{Total no. patient encounters surveyed}} \times 100$$

Antibiotics are as defined by the authors. Normally in primary health care, metronidazole is not defined as an antibiotic; if the authors define metronidazole as an antibiotic, a note should be made in section 4.

ARI: % ARI cases treated with cough syrups

$$\frac{\text{No. cases acute respiratory tract infection prescribed cough syrups}}{\text{Total no. cases of acute respiratory tract infection}} \times 100$$

Cough syrups are medicines defined by the authors as relieving the symptoms of cough and cold. They are non-antibiotic drugs, often available as fixed dose combination products and include:

- cough suppressants (including sedating antihistamines, codeine, pholcodine, dextromethorphan)
- cough expectorants (including ammonium chloride)
- demulcent cough preparations (containing soothing substances such as syrup or glycerol)
- decongestants (including pseudoephedrine).

Avail: % facilities with spec. drug avail

$$\frac{\text{No. facilities with a specific drug available}}{\text{Total no. facilities}} \times 100$$

For WHO, Division of Child Health and Development (WHO/CHD) control of ARI studies, the indicator "Facilities with first-line antibiotics" is interpreted as "% facilities with spec. drug avail."

For WHO/IMCI studies, the indicator "Facilities with all essential oral treatments available" is interpreted as the indicator "% facilities with spec. drug avail."

Cost: % drug costs on antibiotics

$$\frac{\text{Cost for all antibiotics}}{\text{Total drug cost}} \times 100$$

All costs should be converted to US$ using the conversion rate applicable during the year of the survey. If the year of survey is unknown, the year of publication may be used, a note being made in the notes box of section 4.

Cost: % drug costs on injections

$$\frac{\text{Cost for all injections}}{\text{Total drug cost}} \times 100$$

All costs should be converted to US$ using the conversion rate applicable during the year of the survey. If the year of survey is unknown, the year of publication may be used, a note being made in the notes box of section 4.

Cost: Av. drug cost per patient (USD)

$$\frac{\text{Cost for all drugs prescribed}}{\text{No. patient encounters surveyed}}$$

All costs should be converted to US$ using the conversion rate applicable during the year of the survey. If the year of the survey is unknown, the year of publication may be used but a note should be made in the notes box of section 4.

Diarrhoea: % treated with ORT

$$\frac{\text{No. cases of diarrhoea treated with oral rehydration therapy}}{\text{Total no. cases of diarrhoea}} \times 100$$

In WHO, Division of Child Health and Development (WHO/CHD) control of diarrhoea studies, the indicator "Correctly rehydrated" is **not** interpreted as % diarrhoea treated with ORT because all aspects of rehydration are included not just prescription of Oral rehydration therapy (ORT). Also advice to give ORT or other rehydration solutions (ORS) and fluids is **not** interpreted as % diarrhoea treated with ORT because such advice does not mean that the patient is necessarily treated with ORT. Such advice is partially covered in the indicator "Info: % patients given dosage instructions" (see relevant indicator).

In WHO/IMCI studies the indicator "Child with dehydration is correctly treated" **is** interpreted as "% diarrhoea cases treated with ORT" because this indicator covers the use of ORT as observed by investigators at facilities but does not include other aspects of diarrhoea case management.

Diarrhoea: % treated with anti-diarrhoeals

$$\frac{\text{No. cases of diarrhoea treated with anti-diarrhoeals}}{\text{Total no. cases of diarrhoea}} \times 100$$

Anti-diarrhoeal drugs are medicines defined by the authors as relieving the symptoms of diarrhoea. They are non-antibiotic drugs and include adsorbents and bulk forming drugs, anti-motility drugs and anti-spasmodic drugs. Often such preparations are fixed dose combination products.

Diarrhoea: % treated w. antibiotics

$$\frac{\text{No. cases of diarrhoea treated with antibiotics}}{\text{Total no. cases of diarrhoea}} \times 100$$

Anti-amoebic drugs such as metronidazole are often inappropriately used to treat acute diarrhoea. They should not be classed as an antibiotic in the database. If a study/survey reports use of anti-amoebic drugs to treat diarrhoea, a note should be made in section 4 of the % of diarrhoea cases treated with metronidazole (or anti-amoebic drug).

Drugs: Av. no drugs per patient

$$\frac{\text{Total no. of different drug products prescribed}}{\text{No. of patient encounters observed}}$$

Drugs: % patients treated without drugs

$$\frac{\text{No. patient consultations in which drugs are not prescribed}}{\text{Total no. of patient consultations surveyed}} \times 100$$

Drugs: % key drugs available in facility

$$\frac{\text{No. specified drug products actually in stock}}{\text{Total no. of drug products on a pre-determined list of key drugs}} \times 100$$

For WHO/IMCI studies, the indicator "Index of availability of essential oral treatments" is interpreted as the indicator "% key drugs available in the facility".

Drugs: % prescribed that are dispensed

$$\frac{\text{No. drugs actually dispensed at the health facility}}{\text{Total no. drugs prescribed}} \times 100$$

EDL: % prescribed drugs from EML (EDL)

$$\frac{\text{No. drug products prescribed which are listed on the EML}}{\text{Total no. drug products prescribed}} \times 100$$

EDL: % facilities with EML (EDL) available

$$\frac{\text{No. facilities with national EML or local formulary available in facility}}{\text{Total no. of facilities}} \times 100\%$$

Generic: % prescribed by generic name

$$\frac{\text{No. drugs prescribed by generic name}}{\text{Total no. drugs prescribed}} \times 100$$

Info: % patients given dosage instructions

$$\frac{\text{No. of patients given dosage instructions}}{\text{Total no. of patients observed}} \times 100$$

In WHO, Division of Child Health and Development (WHO/CHD) control of diarrhoea studies, the % of caretakers instructed on how much and when to give ORS is interpreted as "% patients given dosage instructions" because this is the nearest equivalent to dosing. Other indicators on patients being taught how to make ORS or how to recognize dehydration are not use for this indicator.

In WHO/CHD control of ARI studies "% caretakers given dosage instructions" should be interpreted from the text with regard to % caretakers given dosing instructions with regard

to antibiotics. In the absence of a detailed individual report for the survey, the indicator "% caretakers correctly advised" from the multi-country report WHO/CHD 1996-7 report may be used, in which case a note should be made in the notes box in section 4.

For WHO/IMCI studies, the indicator "Child prescribed oral medication whose caretaker received counselling on how to administer the treatment" is interpreted as the indicator "% patients given dosage instructions".

Info: % facilities with impartial information

$$\frac{\text{No. facilities where a listed source of impartial information is present}}{\text{Total no. of facilities surveyed}} \times 100$$

Inject: % patients prescribed injections

$$\frac{\text{No. patient encounters where one or more injections are prescribed}}{\text{Total no. patient encounters surveyed}} \times 100$$

Inject: % patients prescribed injections inappropriately

$$\frac{\text{No. patients prescribed injections inappropriately}}{\text{Total no. patients (whether or not prescribed injections)}} \times 100$$

Inappropriate injections should be defined by the authors.

Know: % patients with correct dosage knowledge

$$\frac{\text{No. patients adequately reporting dosage schedule for all drugs}}{\text{Total no. patients interviewed}} \times 100$$

In WHO/CHD diarrhoea control studies, patient knowledge about the preparation and administration of oral rehydration solution (ORS) is used for interpreting the indicator on "% patients with correct dosage knowledge" because this is the nearest equivalent to dosing information. Sometimes this overall indicator is not given and only the individual components are given consisting of ORS preparation, how much and when to give, and how long to keep when prepared. In these circumstances the result for "when and how much to give" is used, this being the nearest equivalent to dosing. The other aspects of diarrhoea management concerning patient knowledge of home care and prevention of diarrhoea are not used.

In WHO/CHD ARI control studies, patient knowledge should be interpreted from the text with regard to knowing about antibiotic dosing and duration. If these two aspects are reported separately, the lowest figure is taken.

For WHO/IMCI studies, the indicator "Caretaker of child prescribed ORS and/or antibiotics and/or antimalarial can describe how to give treatment" is interpreted as the indicator "% patients with correct dosage knowledge".

Label: % drugs adequately labelled

$$\frac{\text{No. of drug packages adequately labelled}}{\text{Total no. drug packages dispensed}} \times 100$$

Adequate labelling should be defined by the authors. An adequate label should normally include at least patient name, drug name and when the drug should be taken. If the authors definition differs from this, a note should be made in section 4.

Malaria: % treated w appr.anti-malarials

$$\frac{\text{No. cases of malaria prescribed appropriate anti-malarial}}{\text{Total no. cases of pneumonia}} \times 100$$

Appropriate antimalarials should be defined by the authors. If there is no mention of the appropriateness of the antimalarial treatment, it should be assumed to be appropriate but a comment should be made in the notes box in section 4. Injectable antimalarials are regarded as inappropriate unless otherwise stated by the authors. Such a study/survey should always be discussed between the data-entry person and the person in charge of the database.

In WHO/IMCI studies the indicator "Child with malaria is correctly treated" is interpreted as " Malaria: % treated w appr.anti-malarials" because this indicator does not include other aspects of case management.

Mortality rates

$$\frac{\text{No. deaths over a defined period of time in a defined population}}{\text{Defined population at risk of death in the time period}}$$

Mortality rates are usually expressed as no. deaths per 1000 persons at risk and can be expressed by cause (all causes or certain disease categories) or by age (infant mortality, under 5 years mortality, etc):

- MR: all causes per 1000
- MR: due to ARI per 1000

- MR: due to diarrhoea per 1000
- MR: due to malaria per 1000

The age group of the population at risk and the size of the population at risk should be entered in the relevant boxes "Age group" and "Total population" in section 3 under "If mortality study".

Pregnant: % treated with iron +/- folic acid

$$\frac{\text{No. pregnant women treated with iron +/- folic acid}}{\text{Total no. pregnant women}} \times 100$$

The indicator concerns the treatment of pregnant women with iron plus or minus folic acid. Vitamins and folic acid alone without iron do not count as "treated with iron +/- folic acid".

POM: % patients receiving without prescription

$$\frac{\text{No. patients that receive a POM without a prescription}}{\text{Total no. patients receiving a POM}} \times 100$$

Prescription-only-medicines (POM) are either defined as such in the article or are otherwise considered to be injections and antibiotics.

POM indicator figure cannot be based on a simulated patients survey.

Satis: % patients satisfied with treatment

$$\frac{\text{No. of patients who report being generally satisfied}}{\text{Total no. patients interviewed}} \times 100$$

Patient satisfaction is defined by the authors and a note should be made of the definition in section 4.

STG: % treated in accordance with STGs

$$\frac{\text{No. cases treated in accordance with standard treatment guidelines}}{\text{Total no. of cases reviewed}} \times 100$$

Treatment in accordance with Standard Treatment Guidelines is as judged by the authors. This STG adherence indicator normally concerns drug treatment only. If it concerns also

patient assessment, referral and caretaker advice as in ARI/CDD/IMCI studies, then this should be indicated in the notes box in section 4.

For WHO/CHD ARI control studies, the STG indicator concerns treatment for all types of ARI and not just pneumonia.

For WHO/CHD diarrhoea control studies, the STG indicator concerns the correct rehydration for diarrhoea cases (both ORS, IVI, dose, duration, etc.) and does not refer to the % of diarrhoea or dysentery cases treated with antibiotics or ORS for which there are separate indicators. It does not refer to the % of children correctly managed because that indicator includes correct assessment, advice and referral.

For WHO/IMCI studies, the indicator "Child needing oral antibiotic and/or antimalarial is prescribed drug(s) correctly" is interpreted as the indicator "% treated in accordance with STGs". It does not refer to the % of children correctly managed because that includes correct assessment, advice and referral.

STG: % facilities with STGs available

$$\frac{\text{No. facilities with national STG or local protocols available in facility}}{\text{Total no. of facilities}} \times 100$$

In WHO/IMCI studies, "IMCI chart, booklet(s) and mothers' counselling cards" are counted as STGs. If not all these three are present, the minimum that must be present for interpretation as STG availability is the booklet.

Time: Av. consultation time (min.)

$$\frac{\text{Total time for a series of patient consultations}}{\text{Number of patient consultations}}$$

Excludes waiting time.

Time: Av. dispensing time (sec.)

$$\frac{\text{Total time for dispensing drugs to a series of patients}}{\text{Number of patient encounters}}$$

Dispensing includes preparation of a prescription and interaction between the patient and the dispenser. Dispensing time may include or exclude prescription preparation time. Dispensing time should be defined by the authors and a note should be made of the definition in section 4.

Vits: % cases prescribed multivit/tonics

$$\frac{\text{No. patient encounters where 1 or more vitamins/tonics are prescribed}}{\text{Total no. patient encounters surveyed}} \times 100$$

This indicator includes all vitamins, multivitamins and tonics.

Rate

This is the number stated in the report / article for a specified outcome variable for a specific group and period.

Sometimes articles / reports do not give indicators in the required format but have sufficient data to enable the indicators used in the database to be calculated. If calculations are done, a note should be made of exactly what was done in the box "notes on study outcome measures" at the bottom of section 4. In all cases, averaging should be done at the level of the health facility rather than the individual patient, if possible. Weighting of averages should only be done at the level of facility. The following types of calculation may occur:

Averaging of an indicator across:

- patients with different diseases
- patients with different severity of the same disease
- patients of different ages
- patients of different gender
- different geographical areas, including rural / urban
- different drug outlets of the same type

Calculating indicators where the indicator is not given, but where data on the necessary numerator and denominator to calculate the indicator are given, e.g.

- ***Calculation of the "average no. drugs per patient" from the:***
  - ➔ Number of patients receiving a particular drug and the total number of patients,
  - ➔ Number of patients prescribed one drug, two drugs, three drugs, etc.

- ***Calculation of the "% drugs prescribed by generic name" or "% prescribed drugs belonging to the EML", respectively from the:***
  - ➔ Number of drugs prescribed by generic and the total number of drugs prescribed,
  - ➔ Number of drugs belonging to the EML and the total number of drugs prescribed.

- *Calculation of the "% prescribed drugs dispensed" from the:*
  - ➔ Number of dispensed drugs and the number of prescribed drugs.

- *Calculation of the "% diarrhoea cases treated with ORT" from the:*
  - ➔ Number of cases of diarrhoea and data on the number of cases of diarrhoea treated with ORT, the latter being presented as cases treated with ORT alone and in combination with other drugs such as antibiotics, anti-diarrhoeals and other drugs.

Calculating indicators where the indicator is not given and where only some data on numerator and denominator is given; calculation of indicators can only be done by making certain assumptions, which should always be discussed between the data-entry person and the person in charge of the database. Such calculations should only be done where the assumption is very likely and some examples are given below:

- Average number of drugs per child < 5 years = 2.2; 20% drugs were injections; 500 children

  No. of drugs = 500 x 2.2 = 1100
  No. of injections = 20% of 1100 = 1100/5 = 220

  Assuming one injection given per patient (very likely in a child < 5 years with an average of 2.2. drugs per child), then:
  % patients given an injection = (220/500) x 100 = 44%

- 200 cases of diarrhoea; 400 drugs given; 20% drugs were ORT

  No. of drugs that were ORT = 20% of 400 = 400/5 = 80

  Assuming one ORT prescription given per patient, then:
  % of diarrhoea cases receiving ORT = (80/200) x 100 = 40%

- 60 patient consultations; 30% consultation <5 mins, 50% 5-10 mins, and 20% >10 mins

  No. consultations of <5 mins = 30% of 60 = (60/100) x 30=18
  No. consultations of 5-10 mins = 50% of 60 = (60/100) x 50=30
  No. consultations of >10ins = 20% of 60 = (60/100) x 20=12

  Assuming consultations < 5 mins= 5 mins, consultations of 5-10 mins = 7.5 mins and consultations of > 10 mins = 10 mins, then:
  Av. consultation time = [(18 x 5)+(30 x 7.5) + (12 x 10)]/(18 +30 + 12)
  = (90 + 225 + 120)/60 = 444/60 = 7.4 mins

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Medicines are one of our most cost-effective health interventions and billions of people take them every year. However, they are only effective if used correctly, and there is evidence suggesting that more than half of all medicines are not used in an appropriate way. Inappropriate use of medicines is a worldwide problem that endangers lives and wastes money. Common examples include polypharmacy, overuse of injections, inappropriate use of antimicrobials, failure to prescribe in accordance with clinical guidelines and irrational self-medication, often with prescription-only medicines. Unfortunately, in many countries use of pharmaceuticals is not routinely monitored, resulting in a dearth of information. Improving medicines use has not been a high priority nationally or globally, and the core strategies available to ensure rational use are not being widely implemented.

The first step to improving the current situation is to measure how medicines are used and this forms the basis of advocacy for change. This Fact Book describes the findings from a WHO database of all the medicines use surveys and interventions to improve use in developing and transitional countries at primary care level, reported or published between 1990 and 2006. The aim is to provide a picture of medicines use in developing and transitional countries, and the impact of interventions, during the last 20 years.

The information presented here is intended to stimulate action to increase the rational use of medicines, and inform and facilitate the setting of priorities and targets. The Fact Book will be a useful tool for researchers, policy-makers, planners and others involved in the pharmaceutical sector. International agencies and donors may use the information in this Fact Book as baseline data to infer the impact of future activities. Professional groups and nongovernmental organizations can use the results for advocacy.

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